UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF OHIO

EASTERN DIVISION

IRON WORKERS LOCAL UNION)
NO. 17 INSURANCE FUND and)
its Trustees, et al.,)
Plaintiffs,) No. 1:97CV1422
vs.) VOLUME I
PHILIP MORRIS, INC., et al.,)
Defendants.)

Deposition of DR. RICHARD THOMAS, at the offices of Jones, Day, Reavis & Pogue, 1450 G Street, Northwest, Suite 600, Washington, D.C., commencing at 8:48 a.m., Thursday, December 17, 1998, before Jayne M. Toering, Notary Public.

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(Thomas Exhibit No. 1
was marked for identification and is
annexed hereto.)

VIDEO TECHNICIAN: This is the video deposition of Dr. Richard Thomas taken by counsel for the Plaintiffs in the matter of Iron Workers Local Union No. 17 Insurance Fund and its Trustees, et al. vs. Philip Morris in U.S. District Court for Northern District of Ohio, Case Number 1:97-CV-1422, held at 1450 G Street, Northwest, Suite No. 600, Washington, D.C., on December 17th, 1998, at the time indicated on the video screen.

My name is Brian Nern. I'm the video specialist. The court reporter today is Jayne M. Toering from the firm of Interim Reporting.

Counsel will now introduce themselves.

MR. CRANDALL: On behalf of the plaintiff, by name is Steve Crandall.

MR. RYERSON: On behalf of Defendant R.J. Reynolds Tobacco Company, Paul Ryerson.

(Continued on next page.)

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DR. RICHARD THOMAS,

having been first duly sworn, testified as follows:

EXAMINATION

BY MR. CRANDALL:

Q. Dr. Thomas, we met a moment ago. My name, as you heard, is Steve Crandall and I do represent the Plaintiffs in this case known as the Iron Workers Local case in the District of Ohio.

I am going to be asking you some questions. And last evening I did review some deposition transcripts of yours, so I take it you have been deposed previously in connection with tobacco matters; is that right?

A. Yes.

Q. Are you generally familiar with the admonitions that are given at the beginning of such depositions?

A. I am not sure what you are referring to.

Q. Okay. I am talking -- You recognize you've taken an oath, and although we are in a conference room in an informal setting here that your obligation to tell the truth is the same as

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if you were testifying before a judge or a jury?

A. Yes.

Q. And if there are questions I ask you that you believe are ambiguous, will you please ask me to rephrase them so you are not answering a question you don't understand, okay?

A. Yes.

Q. And is there any reason, health-wise or otherwise, why you feel you would be unable to go forward with the deposition today?

A. No.

Q. Okay.

VIDEO TECHNICIAN: Sorry, one second. Can you see if your microphone is turned on? It's on the box.

(A discussion was held off the record.)

VIDEO TECHNICIAN: Okay. Going back on record at 9:13:50.

BY MR. CRANDALL:

Q. My first question to you, Dr. Thomas, is how did you become involved in this particular case? In other words, what were the circumstances of your retention in this case?

A. A few months ago Mr. Ryerson

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approached me and asked me if I may be interested in reviewing information concerning the case, technical information. And then later he called and asked if I would be willing to consider being an expert witness.

Q. And about when was this that he first contacted you?

A. It was during the summer, late summer. My best estimate would be late in July.

Q. And you indicated, I think, that there were some materials that he sent for you to review; is that right?

A. Initially, no.

Q. Okay. So you just had a phone call with him at that time?

A. Yes, I had a phone call.

Q. And what was the substance of the phone call?

A. We talked briefly about what the case was and then subsequently met to discuss it briefly.

Q. Okay. Where did you meet and how long after your initial phone call?

A. We met here at this office, and it was probably within a week to two weeks after the

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initial phone call.

Q. And what did you do at that meeting?

A. We discussed some of the technical issues in the case and talked about some of my background that was similar to some of the technical issues.

Q. Okay. When you say "technical issues in the case," what do you mean?

A. Such issues as the risk that various occupational groups may be exposed to as a part of their occupational exposures.

Q. What else?

A. I believe that was most of our discussion.

Q. All right. And can you be more specific in terms of how that discussion unfolded? In other words, I recognize you've indicated the subject matter, but can you be more detailed in terms of what you actually discussed?

A. Well, like I say, it's been some months ago that that occurred. But I was asked if I'd had some experience in looking at occupational risks, and I indicated that I had.

And we talked specifically about some of the types of risks that people working in the

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steel industry and allied industries may have. And I had indicated that I had also had experience in those areas. And so that was the substance of the discussion.

Q. And why was made -- withdrawn.

How did it come up that you were told that occupational exposures might be relevant to this case?

A. Well, the case, as I understand it, it involves risks from cigarette smoke. And we talked about other types of risks that workers may be exposed to.

Q. Okay. That might be a confounding factor in when the Plaintiffs' beneficiaries in this case might develop cancer?

A. Well, when I look at risks of developing cancer in an individual, people are exposed to a number of different things and have different types of backgrounds.

And so because cancer is multifactorial, I tend to think of risks in that light, not just a single risk, but multiple risks. And in this particular setting, these are people that have been associated with the steel industry, and so these may be competing types of risks.

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Q. And can you be more specific when you say "competing types of risks"?

A. Well, in other words, as I had indicated, with cancer you have the potential for multiple risks, for the formation, say, of a tumor.

And so in thinking about how the tumor may be formed, a person could be exposed occupationally to several different chemicals that may also contribute to the risk of them developing cancer in addition to cigarette smoking.

Q. How long did the meeting with Mr. Myerson last, approximately, the first one on this case?

A. I don't remember. I would guess a little over an hour.

Q. Were you -- withdrawn.

Did you review any materials at the meeting?

A. As I remember it, there were -- there was a title page, probably a complaint title page which indicated who was involved in the lawsuit. And I think that was the only materials that I had seen.

Q. Okay. Did you make any notes of the

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meeting?

A. I may have. I typically make notes of meetings, but I don't remember from this particular one.

Q. Okay. Is it possible you would still have in your possession notes from the first meeting?

A. Probably not.

Q. Why do you say that?

A. I don't retain notes for very long after, particularly initial meetings of that type.

Q. Why not?

A. I just, as a practice, have not for years. My background is science and running laboratories, and I just typically don't maintain a lot of handwritten notes.

Q. Okay. But you did know at the time you first met with Mr. Ryerson that the matter was in litigation; is that right?

A. Yes.

Q. All right. Have you retained any notes that you've made in connection with your review and report prepared in this case?

A. No.

Q. Okay. And let me -- I've had marked

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Deposition Exhibit 1, which is your expert witness report in this case, I believe. But why don't you tell --

A. Maybe I could clarify that. I did review some scientific information, which at some point I summarized, which on page 5 of this report it refers to occupational risks should be considered.

And I think it was, like I say, the best I remember a one- or two-page summary which summarized some of scientific literature that I examined. I guess you could say that that was used in this, preparation of this report.

Q. Okay. And do you still have that memorandum?

A. Yes, I believe so.

Q. All right. And how long is it, approximately?

A. I haven't looked at since I prepared this, but it's probably one, two, one to two pages would be my guess.

Q. And I'm sorry I'm being a little repetitive, but what is the -- what is the memorandum?

A. It's simply a summary of some of the

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information that I had pulled or we had pulled from the literature to look at, like I say, various types of risks in these occupations.

Q. Okay. At the back of your report, which is part of Exhibit 1, there is a list of references of materials that you reviewed. Do you see that?

A. Yes.

Q. Are the materials --

MR. RYERSON: Objection as to form.

MR. CRANDALL: Okay. All right.

MR. RYERSON: Use of the word "reviewed," Counsel.

MR. CRANDALL: Oh, okay.

BY MR. CRANDALL:

Q. Mr. Ryerson just indicated that you may not have reviewed all these references, so I guess --

MR. RYERSON: Excuse me. That's not what I indicated. Your question related to reviewed, and the list that's attached refers to rely, not reviewed.

BY MR. CRANDALL:

Q. Okay. Well, let me ask just ask you then, Dr. Thomas, did you review any of these

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references in connection with forming your expert opinions in this case?

A. I reviewed some of them.

Q. All right. And that gets to what I was driving at before, which is, is the list, is the memo that you still have a summary of some of the more salient information in the references?

A. I'd have to look and see. I don't think so because these are a list of scientific references or other types of publications whereas I indicated what I had prepared for Mr. Ryerson was a summary of this type of literature.

Q. Okay.

MR. CRANDALL: Counsel, I would ask that that be produced.

MR. RYERSON: We'll take that under advisement.

MR. CRANDALL: Okay. And just because of the timing, can we have a response in several days?

MR. RYERSON: Yes.

MR. CRANDALL: Okay.

BY MR. CRANDALL:

Q. Now, aside from that memo, are there any other rough drafts or -- well, withdrawn.

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Aside from that memo, are there any other written documents that relate to your opinions in this case that you have in your possession?

A. No.

Q. How did you go about preparing this report, which is Exhibit 1?

A. I had prepared a similar report for another couple of cases. I took that report out, reviewed the report, made some editorial changes that made it more specific to this case, and basically that's how it was prepared.

Q. Okay. I forgot to ask you one question going back to this memo, so I am going to skip back to that, the memo that we just talked about previously. I think you said it contained a summary of the information that we had pulled, using the plural. Who was we?

A. Well, I have other people that work with me in my day-to-day professional activities. And they do literature searching as well. And in this particular case I didn't do the literature searching myself; I asked somebody else to do it.

Q. And who did the literature search?

A. I am not positive of which person

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actually did it, but I believe it was John Maugher.

Q. And how do you spell his last name?

A. It's M-A-U-G-H-E-R.

Q. And what specifically did you tell Mr. Maugher about the literature search he was to do?

A. I sat down and described to him that there was an interest in looking at occupational risks in these various industries, and to prepare and conduct a literature search, like I say, assuming he's the one that did it.

We do a lot of this type of work. And to the best of my knowledge, he's the one that did it. But it may have been one of the other technicians that actually did the search.

Q. And then the results of that search were sent to Mr. Ryerson?

A. I think what I provided to Mr. Ryerson was simply a summary.

Q. Okay. So that would lead me to believe that there might be two documents, one would be an actual literature search done by someone, perhaps Mr. Maugher, and then a summary of that was sent to Mr. Ryerson?

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A. Yes.

MR. CRANDALL: Okay. And I'd ask that both of those be produced, Mr. Ryerson.

MR. RYERSON: We'll take that under advisement.

MR. CRANDALL: Very well.

BY MR. CRANDALL:

Q. Okay. Now, in terms of the report that you prepared, which is Exhibit 1, how did you actually physically go about preparing it? You indicated that there had been reports from other cases, I think; is that right?

A. That's correct.

Q. All right. And then how did you do the actual compilation of this particular report, Exhibit 1?

A. As I remember, I sat down and did some initial review of the previous report in my office. I made some changes, and then Mr. Ryerson and I sat down and I reviewed my changes with him.

And then they typed my changes into the report. I reviewed it, signed it, and then it was delivered.

Q. Okay. Now, you said "previous report," yet I think from looking at your

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depositions you've been involved in several tobacco-related litigations; is that right?

A. Yes.

Q. Which report did you use as a model, if you will?

A. I believe it was a report that was prepared for Minnesota. I actually also looked at one that was, I believe, prepared for Karbiwnyk. That was the State of Minnesota, and then Karbiwnyk was the plaintiff on the other one.

Q. All right. So those were two separate reports or was it one report?

A. No, those were two separate reports.

Q. All right. And you made some written editorial changes on those reports?

A. Yes.

Q. And then you sat down and reviewed those with Mr. Ryerson?

A. Yes.

Q. And then the changes were -- and what was the purpose of sitting down with Mr. Ryerson and discussing those handwritten changes?

MR. RYERSON: Objection as to form.

THE WITNESS: When I talked with him, we talked about the best way to have this typed and

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sent in.

It could have been typed in my office or it could have been typed down here. Because of my travel schedule, we decided it was easier to have it typed here.

BY MR. CRANDALL:

Q. All right. So all the -- well, withdrawn.

Are you saying that all you discussed with him was the best way to have it typed, or did you actually review substantively the changes with him and go over what you intended to say?

A. No. I did not review substantive changes, only to the extent of making sure that he understood what needed to be typed, what needed to be entered so that I could sign it.

Q. That wasn't clear from the document itself?

A. Not if somebody else is going to type from my handwriting. My handwriting is not that good.

Q. All right. Now, did you retain the written draft of this -- your initial writings on the report?

A. No.

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Q. Why not?

A. I don't retain draft materials.

Q. All right. Aside from making what I'll call the first set of changes; that is, handwritten changes on Minnesota reports, were there any other draft materials that you used in comprising -- withdrawn.

Aside from using the Minnesota reports, were there any other materials that you reviewed particularly to make up Exhibit 1?

A. Well, I don't know the extent to which I reviewed these materials. I looked at several of the materials that are listed in the report references.

And these basically support the statements within this report, and so I examined several of those to make sure they were consistent or that they were the types of things that I wanted to include in the report.

Q. Can you remember which references you looked at?

A. I don't think so.

Q. Sitting here today, are there some references in the list of references that you view as more important than others for purposes of your

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testimony in this case?

A. That's difficult to say because I have -- like I say, these were references that I had used or felt were important for this particular report. I don't know which one of these I will rely upon for actual testimony.

Q. Well, would you say -- if you, in connection with your testimony -- withdrawn.

In connection with your testimony at trial, are there any references that you see as particularly important in the Iron Workers matter?

A. Well, like I say, I don't know enough about what I will actually testify at trial past what's said in this expert report.

There are some references that I like better than others, but that's -- but I don't know if I could identify which ones are more important than others in providing testimony.

Q. Okay. Well, this is a little problematic for me only for this reason. Your expert report, which is Exhibit 1, is supposed to be basically a report of what you will testify to at trial.

And while it is certainly not a verbatim description of what you will testify

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about, the plaintiffs are entitled to know the basic substance of your testimony.

So from your response a few seconds ago, you said I'm not sure exactly what I will be testifying to at trial, I guess my question to you in that regard is this: Is there anything that's not contained within Exhibit 1 that you believe you may testify about at trial?

MR. RYERSON: I'm going to object to the form of the question. But you may answer it.

THE WITNESS: Well, I'm not sure I quite understand your question. This expert witness report describes my understanding of the areas that I would be testifying on, but, I mean, there are several pages of references that support that.

So I'm not sure I understand your question other than you're asking me which one of these is more important, and it's very difficult at this point to say which ones are more important.

I can tell you which ones I like versus some others, but I think this summarizes what I would plan on testifying about.

Q. Okay. Well, I had -- there are two issues. The first is you talk about summarizes in

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areas. And actually -- in other words, what you just said, I think, was that there are areas -- this report outlines the areas on which you will testify and summarizes what you'll say at trial.

And I want to be careful here. This case is going to go to trial in about two months. And plaintiffs are entitled to know if there is anything that you intend to testify about that's not contained in Exhibit 1.

So my question to you is, is there anything that you are aware of relevant to the Iron Workers matter that you expect to testify about that's not contained within Exhibit 1?

MR. RYERSON: I am going to object to the question, the form of the question again. I mean, he is going to testify at trial in response to questions that he is not going to frame.

But you may answer the question.

THE WITNESS: I really don't know how to answer the question other than I think the expert report represents my views. And I assume I will be asked to testify about my views at the trial.

And so I think this is a good description of what my views are. I don't know what I'm going to be asked about.

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BY MR. CRANDALL:

Q. All right. Have you considered what exhibits you'll use to illustrate your testimony, if any?

A. No.

Q. When did you plan to do that?

MR. RYERSON: Objection as to form.

THE WITNESS: It depends on the schedule. I don't know. I haven't really thought about that.

BY MR. CRANDALL:

Q. Okay. Now, you indicated a moment ago with respect to references that there were some you liked better than others. First, what do you mean by when you say like better than others?

A. Well, I do quite a bit of teaching. I teach classes at university, and some references I find more useful in teaching and sometimes more clearly state what I think are the scientific principles that I try to teach. So those I tend to like more, and several of those are listed in here.

And of course, there's one of my own publications, which I also like, is listed in here. But about the best I could do is indicate to you which ones I like and I've used many times

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before in teaching and I think are good at laying out basic scientific principles.

Q. Okay. If you wouldn't mind doing that, please.

A. I had mentioned the first publication, my own, and Higginson, 1992. The five reports, epidemiology reports listed starting with Ochsner, Churchill, Levin, and so forth; those are interesting reports. There's Anderson's listed a little later. Schrek --

Q. Okay. This is Anderson, W.A.D., pathology, is one that you like particularly?

A. Yes.

Q. And there are three in a row there, Ochsner, Churchill, and Levin?

A. Yes, and Levin.

Q. Are those related?

A. Those deal with some of the historical information concerning understanding of lung cancer, particularly as it related to tobacco use in the late 1940s, early 1950s, and I think provide good foundation for that. Wynder, 1953 is another one on that page. And the Wynder of 1950 ought to also be included.

And I mentioned Schrek on page 2.

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Let me look at the others on -- on page 1, Mendelsohn's book on molecular abnormalities; it's actually the Molecular Basis of Cancer is a very good book. And then the Biological Markers in Toxicology in '89 I think is good.

Levin, 1950 on page 2. Stuart, 1962. And then there is -- we get into Surgeon Generals' reports, 1982. The one in 1964. 1981 has got some interesting materials in it.

Q. Just let me know when you flip the page.

A. Okay. Page 3. Peto, 1985. National Cancer Institute, 1980. Ames, '73. Office of Science and Technology Policy, '85. Johnson and Snell, '86. Weinhouse, '86. Robbins, 62.

Q. You're over on page 4 now?

A. Yes, page 4. Boyd, '61. Lazar, 1966. Hammond, '69. Lijinsky and Shubik, '64. Page 5. Van Duuren, '71. Wynder has published several articles.

There's two of them listed on page 5. Peto, '75. Gori, '78. Evans, '86. Bishop, '87. Minna, '89.

Page 6. Passey, '58. Probably Hoffmann, '58. Peacock also deals with the

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British Empire Cancer Campaign. Dontenwill, '62. Leuchtenberger, '62. Harris, '66. Auerback, '67. Leuchtenberger, '67. And then the follow-up to the original one of Auerback's, December, '70.

Hammond, '70. Dontenwill, '70. Stuart, '74. Filipy, '74. Binns, '75. Kendrick, '76. And the Binns, '76. There's actually two Binns that are '76. They're reports of the same study. Dagle, '78, Mohr, '78.

Page 8. Coggins, '80. Dalbey, '80. Kensler, '80. And the one on the same book with Kensler is Hammond and Garfinkel. That's '80. And Beckman and Dalbey, that's '92. Pepelko is 1982. Takahashi, '85. He also published one in '92. Coggins, '93.

Page 9. Hoffmann, '72. Lazar, '74. Lee, '77. Randerath, '88 and McGregor, '82. Melikian, '89. Bair, '67. Cator, '79. Ayesh, '84. Heighway, '86. Bishop, '87.

Borish, '87.

Q. We're over on page 10?

A. Yes, on page 10.

Q. Okay.

A. Rodenhuis, '87. Minna, '89. Pfeifer, '89. And the two Kreyberg articles, '61.

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McDowell, '87. Naisell, '87.

Stockwell, '90. Burney, '59. Garshick, '88. Farber, '60. Berkson, 1960. We have another one by Wynder. I have included a lot of the Wynder articles. Berkson, '55. Science and Judgment, '94.

Passey, 62. Leuchtenberger, '58. There's actually two studies there. There's a '58 and a '61, actually two reports, not different studies. Haag, '60. Reddy, '68. World Health Organization, '86. Frasca, '71. Willis, '60. Miller, '75. Roffo, '38.

Willis, '48. Reimann, '51. Robbins, '57. Curran, '90. Concon, '76. Little, '61. Sterling, '71. Sutter, '96. Gori, 1980. Robbins, '94.

Page 14. Dansi, '59. Dorn, '58. Van Duuren, '71. LeBeau, '86. Billings, '93. Stern, '97. Andjelkovick, '90. Gunter, '80. And Sorahan, '94. That's the last.

Q. Okay. Now, on that list, did you come across any of the references in the literature search that Mr. Maugher had done? In other words, are those in that list that you just went through?

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A. I'm not sure I understand your question.

Q. Okay. I am just trying to see if the -- withdrawn.

There had been a memo on the literature search of occupational-related cancer issues or something like that that Mr. Maugher had done, right? You think it was Mr. Maugher who did it?

A. Maugher? Mr. Maugher.

Q. Maugher.

A. Okay. And what are you asking?

Q. I'm trying to find out if the information that was on the literature search that we talked about earlier that was put in a memo form was incorporated into this list of references.

A. Some of them were, probably.

Q. Can you remember which ones?

A. Not offhand. There are some that may have been, but I don't know if they were or were not.

Q. Okay. Did you prepare this list of references, Dr. Thomas?

A. Yes, I did.

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Q. All right. And how did you go about ordering your references? I see it's not in chronological order or by alphabetical or -- what's the method there?

A. I pulled together a set of references that I thought were important references in this area. I didn't order them in any particular order. Some of them do tend to run chronologically because of the way I pulled them out of my files.

Q. Okay. Is there any particular reason why you didn't put down together the materials from the literature search that Mr. Maugher had done?

A. I don't understand your question.

Q. Okay. And correct me I'm wrong, but you had undertaken at Mr. Ryerson's request, I think, a list of -- a summary of information related to occupational causes or associations with cancer or something like that; is that right?

A. Yes.

Q. Okay. And when and why was that done?

A. I think we already reviewed why it was done is I was asked to go back to the

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literature and look for associated risks with this occupational group or occupational groups. What was the rest of your question?

Q. Well, okay. And in particular with the Iron Workers case, that information would be germane and important, would it not?

A. It could be.

MR. RYERSON: Objection as to form.

BY MR. CRANDALL:

Q. Well, in your -- part of the opinion you are going to be giving in the trial is that the causes of cancer are multidimensional and there is exposure from other risk factors from iron workers, correct?

A. There are other exposures in iron workers that may increase risks.

Q. And you will be testifying, in essence, will you not, that it makes it more problematic at least to determine whether or not smoking is the cause of the cancers that are developed by the iron workers, correct?

A. Well, I can't say state what I am going to be testifying specifically. I think I indicated in my expert witness statement that there are increased risks associated with certain

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occupations --

Q. Um-hmm.

A. -- if that's what you're asking.

Q. That's what I am asking. There are increased -- well, and if that's not significant to your testimony, then I won't ask you about it. But I take it it is.

A. Well, since we are dealing with an occupation, several occupational groups, I assume it will be. That's why it was put in this statement.

Q. Exactly. And you had compiled to support that part of your opinion a list of references that would support your opinion on that ground, didn't you?

A. Yes, those -- the references that support my opinion are attached.

Q. Okay. Well, yes, but -- okay. Let me be clear. But the references that support your opinion regarding the confounding of causation of cancer were culled out specifically and given to Mr. Ryerson, true or not true?

A. I don't know that we gave him any specific references. As I remember, what we gave him was a summary.

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Q. Okay. And that summary was provided to him, right?

A. Yes.

Q. It hasn't been provided to me, has it?

A. Not that I know of.

Q. Why not?

MR. RYERSON: Objection.

You may answer.

THE WITNESS: I don't know.

BY MR. CRANDALL:

Q. All right. Well -- and yet some of those materials have found their way into this 14-page list of references; is that right?

MR. RYERSON: Objection as to form.

BY MR. CRANDALL:

Q. Well -- okay. You can answer that.

A. Like I say, I'm not sure what you're asking.

Q. I'm asking you whether or not some of the references that you provided to Mr. Ryerson had been woven in to the 14-page list of references that are attached as Exhibit 1 to your expert report?

MR. RYERSON: Excuse me. I'm still

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objecting to the form of the question.

BY MR. CRANDALL:

Q. All right.

A. I think, as I had already stated, I don't remember that I provided references specifically to him. I may have provided one or two as examples, but I don't remember. What I do remember is there was a summary that I provided to him.

Q. Okay.

A. And some of the references in that summary may or may not be in this 14 pages. That was fairly early on. That was -- I don't know -- two or three months before this was prepared. And that was basically an initial literature search. We didn't do any more detailed literature searching after that.

This was dated November 16th, '98. And we're talking about something that occurred at the end of summer, early September.

Q. Okay. And I recognize that that goes back some time. But you had -- you've testified in depositions related to other tobacco litigations before today, correct?

A. Yes.

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Q. And you've prepared perhaps half a dozen expert reports on the subjects that are covered in Exhibit 1, correct?

A. I don't know the exact number, but it's probably at least a half dozen.

Q. Okay. In those other cases, is it fair to say that what you did was basically modify your expert report slightly, but in essence the gist of it was the same?

MR. RYERSON: Objection as to form.

THE WITNESS: I don't think that's a fair statement. The expert witness report is prepared based on what I best understand are the issues in the particular case.

BY MR. CRANDALL:

Q. Okay.

A. It may have been similar; it may have been different depending on what the issues are.

Q. Okay. From the time you were retained by Mr. Ryerson in this case to the time of signing your expert report on November 16th of 1998, aside from looking at your other expert reports and doing the literature search, what else did you do in connection with forming your opinions?

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A. Well, this is an area that I do research in and work in all the time. I continue to read scientific literature, books. I am a reviewer on books and I do chapter review. I am involved in these types of scientific issues on a day-to-day basis.

So it's very difficult for me to say, well, you know, I did this and this and this, when in fact I work on 15, 20, 30 projects at a time and all of them have literature searches and so forth.

I approach this as I do other types of activities that are similar. And I think what I have described to you is basically the background of how that was prepared.

Q. Okay. Well, I recognize your memory -- you may not remember everything you did. But I am entitled to try and find out, if I can. So my question is, aside from -- and if it takes some elaboration, feel free to do it, but aside from your looking at your prior expert reports and doing a literature search, what else did you do between the time Mr. Ryerson talked to you sometime in the summer and the time you signed this report in November of 1998 in connection with

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forming your expert opinions in this case?

A. Well, I have files of information, as most scientists do, that I have accumulated over the years of, as I indicated, literature that I have reviewed, and I certainly examined some of that.

I may have looked at textbooks. I may have thought about past depositions, as well, and expert witness reports, as I indicated, in preparing this report.

Beyond that, I'm not sure how to answer your question in that this is part of my day-to-day activity and that's what I would do on most issues that I am working on.

Q. Okay. When you say it's "part of my day-to-day activity," I'm not sure I follow what you mean by that.

Are you saying that what you are testifying about at this coming trial is something that you are involved in every single day; is that what you are saying?

A. I'm involved in cancer research on a day-to-day basis. If that's your question, the answer is yes.

Q. Well, it's not quite my question, but

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it's part of my question. My question is, are you saying that each and every day that you are at the office you are doing work that is relevant toward your opinions in Exhibit 1?

A. Yes.

Q. Okay. And why is that?

A. Because that's the area that I specialize in.

Q. All right. Cancer in general or cancer related to tobacco in particular?

A. Cancer in general.

Q. All right. All right. Then in connection with issuing your expert report, which is Exhibit 1, did you look at the plaintiffs' complaint before you wrote your report?

A. I believe so, because I normally ask for those beforehand.

Q. Is there any way for you to tell from your files whether or not you did? In other words, do you have a copy of your Iron Workers' complaint in your files?

A. If I looked at it, it would be in my files.

Q. All right. Do you have your files with you?

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A. No.
Q. How big are your files?
A. Specific to this case?
Q. Yes.
A. I don't know. An inch or two.
Q. Okay. And those are segregated. In other words, you have an Iron Workers file; is that right?
A. Yes.
Q. Would that have your retention agreement with the Jones, Day firm in it?
MR. RYERSON: Objection as to form.
You may answer.
THE WITNESS: It probably has a letter in it from Mr. Ryerson.
BY MR. CRANDALL:
Q. And what other materials does it have in it?
A. There are two expert witness reports in it that Mr. Ryerson sent to me.
Q. And which two are those?
A. One by a Dr. Davis. And another one by -- I can't think of his name, a historian.
Q. Okay. And those are plaintiffs' experts?

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A. Yes.
Q. In this matter?
A. Yes.
Q. And when did you receive those?
A. I don't know the date that I received them. I assume that it was before I prepared the expert witness report.
Q. Why do you assume that?
A. Just because there is -- I only remember one mailing from Mr. Ryerson and it was during the time that I was preparing this report.
Q. And it had those two reports in it?
A. Yes.
Q. What else is in your file with respect to this case?
A. As you indicated, there may be a copy of the complaint. And there may be some literature searches. I don't know.
MR. CRANDALL: Let me add that to my list, Mr. Ryerson, of material that we request is that the files be produced in this case.
MR. RYERSON: That being his entire file?
BY MR. CRANDALL:
Q. I think you indicated it's about an inch thick, is that right, of an inch-and-a-half

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thick?

A. Well, that's just a guess. It may be a half inch.

MR. CRANDALL: Okay. Yes.

MR. RYERSON: We will take that under advisement.

BY MR. CRANDALL:

Q. Okay. Now, I think you -- withdrawn. Is there any way -- withdrawn.

Do you remember if in fact you did look at the plaintiffs' expert reports before you prepared your opinion in this matter?

A. I don't remember if it was before or after. Like I say, I assume that it was before, but I don't know that.

Q. Okay. And did you find -- did you take note of anything in particular that Dr. Davis said in his expert report that you agreed or disagreed with?

A. I don't know after reading that so many weeks ago. I don't know.

Q. Okay. So you can't remember whether or not you -- you can't remember what's in his report or what you might agree or disagree with; is that right?

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A. No, I didn't say that.

Q. Okay. Maybe I misunderstood you. What did you -- what role, if any, did Dr. Davis' report play in the formation of your expert opinions?

A. I don't remember that it served very much of a basis for the formation of my opinions.

Q. Do you expect to testify at trial whether Dr. Davis is right or wrong in connection with his opinions?

MR. RYERSON: Objection as to form.

BY MR. CRANDALL:

Q. Do you expect to testify at trial as to whether or not you agree or disagree with Dr. Davis' opinions?

MR. RYERSON: Same objection as to form.

THE WITNESS: I don't remember the specifics of what he said and did not say. I know that he generally described some medical issues. But -- and we may differ in what those were, but I don't remember the specifics of his report sufficiently to say that I would disagree or agree with them.

MR. CRANDALL: Okay. Mr. Ryerson, this makes it problematic for me to do a deposition. If, in fact, this witness is going to testify with

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respect to Dr. Davis' work in any regard, I am entitled to know what that testimony is going to be.

MR. RYERSON: You may well be right about that, Counsel. But proceed with your deposition of what he knows.

MR. CRANDALL: No. I'm just pointing out there's a problem.

BY MR. CRANDALL:

Q. You also indicated there was also a historian whose name you can't remember whose report you reviewed; is that correct?

A. Yes, there was.

Q. All right. And you can't remember his name?

A. No, I don't remember his name right offhand.

Q. Do you remember anything in that report that is germane to what you are going to testify about?

A. To a limited extent he talked about what had occurred in the 1940s, 1950s, and, as I remember it, early 1960s up to the Surgeon General's report in medical publications, what types of publications were published and so forth.

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And that's about the only thing that I remember that may be of interest in preparing for testimony.

Q. Okay. And what interest is that to you?

A. Well, that's -- that follows also the development of the science that occurred during that time period, by taking early Roffo in 1938 and the skin painting studies and the general development of this field in the 1950s.

As I had mentioned, he was a historian and he was talking about, as I remember, from a historical basis, what occurred during those time periods.

Q. Okay. And do you expect to testify from a historical basis what had occurred during those same time periods?

MR. KIERSON: Excuse me. Again, objection as to form.

THE WITNESS: I would anticipate that I would testify based on the scientific development during those time periods.

My testimony would be different from his in that, as I indicated, he's a historian; I'm a scientist, and what occurred during those time

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periods is important to understand what occurred later.

BY MR. CRANDALL:

Q. Do you disagree in this historian's account of what occurred during those time periods?

A. Like I say, I don't remember the specifics of his outline sufficiently. I would assume that I would disagree with some of the things that he said.

Q. But you can't tell me how?

A. No.

Q. All right. Let me -- let me switch for a moment to your relationship or your dealings on tobacco matters. I've asked you about how you came to be involved in this case. But there are other cases --

A. Is it possible we could take a break for just a moment?

Q. Absolutely. Sure.

VIDEO TECHNICIAN: Going off the record at 10:16:51.

(A recess was taken.)

VIDEO TECHNICIAN: Going back on the record at 10:22:15.

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BY MR. CRANDALL:

Q. Dr. Thomas, during the break did you discuss your testimony with Mr. Ryerson?

A. Just briefly.

Q. And tell me exactly what was said by whom.

A. He indicated to me that things seemed to be going well and asked me how I was and I said fine.

Q Okay. Was that it?

A. He mentioned to me that attorneys have a technique of asking the same question numerous times, and in one case I responded by answering a different question and that led into a whole new group of new questions. That was an interesting point.

Q Did you respond to him?

A No.

Q. All right. Was that the sum and substance of what he said to you?

A. Yes.

Q. Did he indicate that I was asking the same question numerous times?

A. I assume that's what it was in reference to. He just said it was a technique

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that was used.

Q. Have I been asking you the same question numerous times, in your opinion?

A. There have been a few times when you have asked me the same question several times and I have tried to answer it.

Q. Okay. Well, let's go to your involvement in other tobacco litigations. We've talked about how you came to be contacted in this case.

And I want to turn to go back in time when you first were contacted to become involved in any kind of tobacco litigation. When was that?

A. Approximately 1984.

Q. And under what circumstances did that occur?

A. I was approached by an attorney from Jones, Day.

Q. And tell me in as much detail as you are able what transpired between you and the attorney from Jones, Day.

A. The attorney from Jones, Day was J. C. McElveen. And he came to me and had -- and again, this is 14, 15 years ago -- but had indicated that I had been recommended to him as an

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expert in lung cancer, and he asked me if I would be willing to read some scientific information for him and give him my opinion.

Q. And did he indicate to you at that time whom he represented?

A. He said he represented Jones, Day. I don't remember the details of the conversation, but I assume that he indicated which company was paying his bills.

Q. Well, did there come a time -- did either them or shortly thereafter did you become aware on behalf of who -- which side in the litigation you would provide support?

MR. RYERSON: Objection as to form; litigation.

MR. CRANDALL: Okay. That's true.

BY MR. CRANDALL:

Q. Was this in connection with litigation or not?

A. I don't believe it was in connection with litigation.

Q. What was it in connection with?

A. He simply wanted some scientific opinions concerning some literature related to lung cancer.

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Q. Did he tell you for what purpose?

A. I don't remember after all these years. I assume at the time he indicated for what purpose, but that's just an assumption on my part.

Q. All right. And have you since that time been able to figure out -- well, withdrawn.

Did you in fact provide that service for Mr. McElveen?

A. Yes, I did.

Q. And what did you do?

A. As I indicated, I reviewed literature from him from time to time. He would send me an article or he would suggest that I get an article out of the scientific literature and review it and provide information to him on that article.

Q. All right. And how long did this relationship go on with Mr. McElveen?

A. Off and on for several years up through the early 1990s.

Q. And during the time of your providing your reviews, were you ever made aware or did you ever find out the purpose that he was making of the material you were submitting to him?

A. Well, I mean, he worked for a law firm. I assumed that this was being used in

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litigation of some type.

Q. All right. Since then, have you found out in any more detail -- withdrawn.

At the time as you were going along doing your review for him, did you ever ask him why you were doing this?

A. I don't know the answer to that. We had conversations off and on over the years. I assume the reason came up as to why he needed it from time to time. I don't remember.

Q. As you sit here today, do you know why you were doing that scientific review for Mr McElveen?

A. I can't -- actually can't really speculate. I assume it's for litigation, but as to what use he made of that, I don't know. I review materials all the time for people and for journals. And I don't know what his motivation was.

Q. Even to this day?

A. Well, I -- we are talking about many years of time, I mean, a lot of different articles, so I don't think you can make a blanket statement as you just did.

Q. Okay. Well, you said, I think, that

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it went on from 1984 through the early 1990s; is that correct?

A. Um-hmm.

Q. And how was the billing arranged? Did you bill the Jones, Day firm directly?

A. Yes.

Q. All right can you approximate for me how much money you billed -- withdrawn.

Was that from you personally or on behalf of some corporation or institution?

A. It was on behalf of a company.

Q. Which company was that?

A. That was Thomas & Thomas Technologies.

Q. And I think from looking at a deposition of yours that's a company that's run by you and your wife; is that right.

A. Well, those are the two Thomases, but there are several people involved.

Q. Okay. But Thomas -- you are the same Thomas of the Thomas & Thomas Corporation, correct?

A. Yes, um-hmm.

Q. All right. And what does Thomas & Thomas do?

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A. It provides what some people would call scientific consulting activities, computer modeling. We have been involved in such areas as genetic engineering, do risk assessment, create computer databases and computer programs.

Q. And can you tell me approximately how much Thomas & Thomas billed to the Jones, Day law firm between 1984 and the early 1990s?

A. That's pretty difficult to do. Between then and the 1990s, no.

Q. Okay.

A. Early 1990s.

Q. You can't do it?

A. No, not for that time period. It is too many years ago.

Q. Okay. Do you -- does Thomas & Thomas maintain account information, historical account information so that one could do a search for Jones, Day and come up with the amounts?

A. Well, historical based on what the IRS requires for taxes.

Q. Right. You would get a 1099 or something like that?

A. Well, yeah, you may get a 1099. There are certain records that are required by the

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IRS to be maintained for three years, some for seven years. Most after seven years are not maintained.

Q. Okay. And again, I am not asking you to be precise, but can you even approximate for me within an order of magnitude of maybe $25,000 what the amount would be?

A. From what time period?

Q. From the time you were first contacted by Mr. McElveen in 1984 until the time that -- you put an end date of the early 1990s and I'm not sure why, but until that end date.

A. I can't pick out just that part of it.

Q. Okay. I take it from your response then that the service is expanded or changed, but continued?

A. Yes, they continued.

Q. All right. Describe how they continued.

A. Well, in addition to working with Mr. McElveen or sometimes having others request information of me, it's continued up to today.

Q. So Mr. McElveen occasionally still consults with you or others from Jones, Day do?

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A. Other from Jones, Day. I haven't worked specifically with Mr. McElveen for the last few years.

Q. Okay. And has your work with Jones, Day been specifically on tobacco litigations or has there been other consulting work done, too?

A. There has been some other consulting work done as well.

Q. Okay. And that continues right up until today?

A. Well, my consulting work with Jones, Day continues to today.

Q. All right. From 1984 through today, can you approximate for me how much money Thomas & Thomas has billed in connection with tobacco-related consultation?

A. It's -- my best estimate -- I haven't gone back and looked at this -- is about 2.6, 2.7 million, of which I have received probably less than 10 percent. And that would be from 1983, 1984 period up through today.

Q. And how did you make that estimate?

A. I had been asked in an earlier deposition on specifics and so decided to sit down and try to put together that type of information

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and had gone back and tried to estimate clear back in the 1980s how much I was paid.

Q. Okay. Do you remember which deposition that was?

A. No; actually, I don't. I think it was actually Minnesota, but we didn't have to -- no, I take it back. It was Karbiwnyk.

Q. And in that Karbiwnyk, did you actually provide the information or did you just as a result of the deposition decide you were going to find out for future reference?

A. I decided I was going to find out for future reference.

Q. Okay. Now, you indicated that 10 percent of that went to you. What did the other 90 percent go to?

A. To pay for -- pay other people and expenses and that type of thing.

Q. Okay. So when you talk about 2.6 million, that's Thomas & Thomas billing to Jones, Day for tobacco-related services over the period of time you've just said?

A. Yes.

Q. All right. Now, you also do other consulting -- and you, meaning Thomas & Thomas --

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does other consulting for Jones, Day?

A. Have done other.

Q. What type of consulting?

A. I've looked at some occupational issues, risk factors in other occupations. Have looked at exposures to other toxic materials.

Q. That's unrelated to tobacco litigation?

A. Yes.

Q. Has it been in connection with litigation?

A. Yes.

Q. And was it in connection with defending claims brought by plaintiffs?

A. I'm not sure I know the specifics enough of those. The one was -- it did have plaintiffs involved in it, and Jones, Day was defending clients. A couple of the others, I'm not sure. I'm not sure I had enough information to answer that for the other areas.

Q. Okay. And on the one that you do recall that involved litigation, what was the nature of that litigation?

MR. RYERSON: Let me object and put some principles on the record. I'm concerned that as

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we get into areas that may involve unrelated litigations that there is an attorney-client privilege for other unrelated clients that could be compromised, and I don't want that to happen.

MR. CRANDALL: Right.

MR. RYERSON: I am just asking you to consider -- and I will listen to each question as you ask -- whether, I mean, certainly if there's another case in which compensation is involved, you certainly can ask about the compensation. If there's another case where there was a public report or a deposition or testimony of any kind, you are entitled to ask about that. I --

MR. CRANDALL: Let me assure you, Mr. Ryerson, that I will -- if you are worried about work product protections, I'm not going to ask -- I will try not to ask a question that directly implicates that, but I think these questions are relevant to bias and so I am going to try to go into them, and I will develop them without exact asking exactly what the opinions were, unless it was a publicly -- unless he was an expert witness designated in which case I will go into it.

MR. RYERSON: And again, I am not troubled

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by your asking questions in any case -- I'm not sure there are any where he's been designated as a -- publicly as a witness.

MR. CRANDALL: Right.

MR. RYERSON: I am concerned that if other clients have consulted with the firm and with, as a result, Dr. Thomas about matters that are not public that might be made public if the product were to be described, for example, I think at that point I would object and instruct the witness not to answer.

MR. CRANDALL: Well, it raises -- I agree with you it raises an interesting sort of --

MR. RYERSON: Yeah, but I am not trying to prevent you from asking about the scope of the relationship or the nature of compensation or anything that is publicly available information about what he may or may not have done.

MR. CRANDALL: I understand that.

BY MR. CRANDALL:

Q. And Dr. Ryerson -- I mean, Dr. Thomas, you've heard our banter back and forth on this issue, so keep in mind Mr. Ryerson's comments as I ask these questions.

But in your mind as I took it, there

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was a case on which you were doing work on behalf of Jones, Day, is that correct, for occupational matters?

A. This dealt with exposure.

Q. Okay. And was it -- it was in litigation?

A. To the best of my memory, it was in litigation.

Q. Okay. Were you designated as an expert in that case or were you what's called a work product consultant where you were offering assistance to the lawyers?

A. I don't believe I was designated as an expert in the case. I think I was a work product consultant.

Q. Okay. Can you tell me what the nature of the exposure was in a way that wouldn't reveal the name of the client?

A. I did sign a confidentiality agreement in developing the information and I don't know to what extent that prohibits my discussing this.

Q. Let me back it in this way, maybe. How much -- for this particular consultation, how much did Thomas & Thomas bill?

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A. I don't remember exactly. I would estimate it was a little less than a hundred thousand dollars.

Q. Okay. And over what period of time was the consultation?

A. Approximately six months.

Q. From when to when?

A. I'm not sure of the date. It was in the early 1990s. Maybe 1990, '91.

Q. Is the matter, to your knowledge, still ongoing or is it over?

A. To my knowledge it was settled out of court. And I think it's been resolved.

Q. All right. And your -- in terms of the subject matter, aside from saying exposure, can you be any more specific with me in giving me an idea of what the consultation was without being so specific that you identify a client?

A. I think what I could probably tell you is simply that it involved lead exposure. And I have worked for many years in the area of lead exposure and exposure to heavy metals. So that's what I reviewed.

Q. Okay. And this was on behalf of Jones, Day who was representing a defendant in

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litigation being sued by plaintiffs over lead exposure?

A. That's my understanding.

Q. All right. Now, you said you've also done other work on consultation issues for Jones, Day, but you weren't sure whether the matters involved litigation; is that right?

A. Yes.

Q. Okay. And has this been ongoing since -- well, withdrawn. Over what period of time has this -- withdrawn. That was a bad -- poorly phrased question.

Over what period of time has this non-litigation consulting gone on?

A. Well, as I indicated, most of the early work that I did for Mr. McElveen was, it is my understanding, not directly related to litigation.

Q. Okay. Excluding that, I should have. I mean, you've talked about and we have approximated the amount of money in the consulting, but I take it that there's other consulting work that doesn't involve litigation; is that right?

A. From time to time I will be called

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and asked about something, but it's similar to the work that I did for Mr. McElveen in that it's not constant work, it's episodic from time to time. People will call because they know that I have expertise in other areas in addition to cancer.

Q. Does Thomas & Thomas have any kind of ongoing retainer with Jones, Day or is it on a case-by-case basis?

A. It's a case-by-case basis.

Q. Can you approximate -- withdrawn. In the matters that you have done the consultation -- this is the non-litigation, non-tobacco matters -- can you approximate the amount of money that Thomas & Thomas has billed to Jones, Day?

A. I'm sorry -- can you -- I was trying to think through what you were asking.

Q. Okay. So far in terms of developing a monetary amount, it appears that Thomas & Thomas had billed Jones, Day about 2.6 million in connection with all tobacco-related consultations up through today.

A. Yes.

Q. And that the exposure case involving lead was about $100,000. Can you approximate for

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me all of the other consultations in terms of what that amount would be, approximately?

A. And these are very rough approximations, I would have to have say less than a few hundred thousand, so that the total would be less than 3 million.

Q. Okay. So the grand total for all Jones, Day consultations since 1984 would be something less than 3 million?

A. Yes.

Q. Okay. And again, have any of these consultations involved matters on behalf of plaintiffs who were considering or suing entities as a result of exposure?

A. Not that I know of.

Q. Have you ever in your career done consulting work on behalf of plaintiffs in connection with exposure-related occurrences?

A. Yes, I have.

Q. Okay. When and where?

A. There are a group of cases in the late 1980s or mid-1980s dealing with solvents at hazardous waste sites. And there were -- there were also some occupational exposures in the tire industry that were about 1989, 1990.

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And in the early 1990s some solvents in paints. And more recently, in about 1993, maybe '94, a case dealing with petroleum solvents in three-in-one oil. I have also testified for the Justice Department.

Q. In what cases?

A. In the mid-1980s representing the Department of Justice and federal agencies for pesticide exposures in federal programs. This was in federal court in the State of Oregon.

Q. Did you actually testify in that case?

A. Yes, I did.

Q. Before which judge?

A. I don't remember the name of the judge.

Q. Do you remember the caption of the litigation, aside from involving pesticide exposures?

A. It had to do with the noxious weeds eradication program planned by the Department of Interior and the Forest Service.

Q. All right. And what was the nature of your testimony in that case?

A. I testified as an expert toxicologist

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and risk assessor looking at exposures and the potential for disease in the population.

Q. All right. In that case was your position that the eradication of the noxious weeds through pesticide exposures would or would not cause a public health problem if that was the -- if I'm on the right subject?

A. I had reviewed those reports, in fact, helped prepare some of them for the Federal Government. And I was testifying in defense of the reports.

And the reports, for the most part had indicated that they would not expect effects in the population from pesticide use, health effects.

Q. Okay. So that wasn't a situation -- withdrawn.

In the plaintiffs' situations -- in any of these plaintiffs' situations, did you wind up testifying in court?

A. The one that I actually testified in court is Davidson, and that's the most recent one that involved the three-in-one oil.

Q. And where did that litigation take place?

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A. It was in the State of Maryland.

Q. In federal or state court?

A. In state court.

Q. And what was the nature of your testimony in that case?

A. That the pulmonary asthma caused to Mr. Davidson was related to his exposure to some of the petroleum solvents in three-in-one oil.

Q. Do you have a copy of your testimony from that trial available in your office?

A. No, I don't. I had requested one, but it was never supplied.

Q. Who were the plaintiff's lawyers in that case?

A. I don't remember who the plaintiff's -- that was Jeffrey Davis and it was versus, I think, three-in-one oil or something like that.

If we had supplied a list of things that I have testified in the past, it would be on that list. Because I pulled out the specifics for the list that we prepared.

Q. Okay.

MR. CRANDALL: Mr. Ryerson, have we been provided with a list like that?

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MR. RYERSON: I don't know. You've been provided with whatever list was required, and so if the testimony was prior to the cut-off period, you may not have been given that.

MR. CRANDALL: Okay.

MR. RYERSON: We do not have a transcript. I'll represent that.

MR. CRANDALL: Okay.

BY MR. CRANDALL:

Q. From whom did you request the transcript in the Davidson matter?

A. From the attorney that I worked with. And I simply don't remember his name at this point.

Q. All right. And in any of the tire industry consultations or solvents and paint consultations or solvents at the hazardous waste sites, did you prepare expert reports?

A. Yes, I did.

Q. In which cases?

A. The solvents at the hazardous waste sites, I prepared a report. And I also did in the paints case.

Q. Do you still are a copy of those reports at your office?

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A. I don't know. I haven't looked for them for a while.

MR. CRANDALL: Mr. Ryerson, I'd request that those be produced.

MR. RYERSON: Let's -- if we can just clarify what you're asking for. You are asking for a report and the approximate date of which is -- if I can ask the witness.

MR. CRANDALL: It's solvents at hazardous waste sites in the 1980s.

THE WITNESS: These were both done in the mid- to late 1980s.

BY MR. CRANDALL:

Q. I had written in my notes the solvents and paints were in the 1990s, but is that so wrong?

A. Well, there was some work on solvents and paints in the 1990s, early 1990s, too. But there was no report produced for that.

MR. RYERSON: Okay. So one is hazardous waste sites -- solvents and hazardous waste sites in the 1980s, and the second report that may exist is --

THE WITNESS: That was in the tire industry.

MR. RYERSON: Tire industry.

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THE WITNESS: That was exposure in the tire industry.

MR. RYERSON: And the approximate date of that?

THE WITNESS: The approximate date is about '88 or '89.

MR. RYERSON: Okay. We will take both those requests under advisement and get back to you.

MR. CRANDALL: Okay.

THE WITNESS: I don't know that I have any reports for those two at this period. Those are fairly old.

BY MR. CRANDALL:

Q. Okay. Now, were you deposed in any of those cases, either this hazardous waste site case, the tire industry case or the solvents and the paints case?

A. No.

Q. And for the plaintiffs' consultation that you did in those cases, do you have in mind a -- withdrawn.

Did Thomas & Thomas bill the plaintiffs in those cases?

A. Yes.

Q. And do you have in mind how much

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money was billed to the plaintiffs in those cases?

A. I would have to estimate. The Davidson case is the one I remember best, because that was the most recent, and that was approximately $25,000.

The earlier cases, I am not sure I could estimate. I would have to guess for both of them. It was somewhere less than 50,000.

Q. Now, when you say both of them, do you mean all three -- I'm using three: The solvents and paints, and tire industry, and the hazardous waste cases as three cases.

A. The solvents and paints was probably less than 20,000. That was a little more recent. The tire industry was probably less than 50,000.

Q. And what about the hazardous waste site?

A. Hazardous waste site was probably less than a hundred thousand. That was a larger project.

Q. Okay. Now -- and how much was your Department of Justice consultation approximately?

A. That has been on going for several years. The best guess is about 250,000. But like I say, that's a guess. But that's within the

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ballpark.

Q. Is -- that case is not still going on today, though, is it?

A. No.

Q. And in that case, was the government a defendant or a plaintiff?

A. I would have to say the government was the defendant.

Q. Was it being sued by environmental groups or the state over the pesticide application?

A. That was mainly environmental groups that were suing the Federal Government.

Q. Now, are you doing any consultation work for plaintiffs today?

A. No.

Q. And having spoken with you over the last several minutes regarding your consultation on behalf of plaintiffs, have we, to the best of your recollection, exhausted your recollection of consultations on behalf of plaintiffs in litigation?

A. Yes.

Q. Now, aside from work on behalf of Jones, Day and work involving tobacco

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consultation, do you -- and again, I am talking about Thomas & Thomas -- provide consultation to other industries?

A. Yes.

Q. Okay. And if it's not violating a confidentiality, can you tell me what industries you provide consultations for?

A. It actually would be violating confidentiality agreements.

Q. Okay. Is there a way to describe the nature of your industrial consultations without giving specific enough information so as to violate a confidentiality?

A. I can indicate general areas that we provide consultation to industry. As I mentioned earlier, we do work on hazardous ways sites, including site assessment work.

And these are for companies that have a concern about a waste site that they own.

Q. And about what percentage of Thomas & Thomas' business did that involve site assessment work?

A. About 30 percent. It may be a little higher. It is difficult to estimate, but approximately 30 percent.

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Q. All right. And what are the gross revenues of Thomas & Thomas today? In other words, 30 percent is of what number?

A. This year -- we are getting towards the end of the calendar year -- we have revenues a little over 3, 3-1/2 million.

Q. And was that -- was 1997 similar or less or more in terms of --

A. It was similar.

Q. Okay. Has -- has that, just for approximate purposes, been a fairly constant revenue source over the last, say, five years?

A. Well, it's been increasing much more substantially since I left the National Academy of Sciences in 1994. Because when I was there, most of my time was spent working for them.

Q. Okay. So it's -- Thomas & Thomas' revenues have gone up since 1994 where today they are approximately about 3-1/2 million?

A. Yes.

Q. All right. And 30 percent of that would be site assessment work on behalf of industry?

A. Yes.

Q. What is --

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A. Like I say, these are approximate numbers, but that's a --

Q. Sure. Sure. And what is the -- can you break down the other 70 percent in terms of the type of work that you do, again, without violating any confidentiality agreements you have?

A. I do about -- well, the other area, large area is developing databases, literature databases and interactive databases.

Q. Okay. Is that -- what's the clientele there? Is that academic or governmental?

A. Some of it's academic, some governmental. There's a little bit of that that's done for industry that -- that's a small part of it.

Q. All right. And what percentage roughly would the database work be of Thomas & Thomas' revenues?

A. I would estimate maybe another 25 to 30 percent.

Q. And of that 25 or 30 percent there's a portion that's attributable to industry, but can you give an idea of how much of that 30 percent might be industry or database consultation?

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A. Probably less than five percent.

Q. Okay. All right. We are up to 60 percent, approximately, of the Thomas & Thomas workload. What does the other 40 percent involve?

A. Certainly the work for Jones, Day is included in that 40 percent. We have various types of project work for the Federal Government that's ongoing as well.

And then Thomas & Thomas makes some money from professional activities such as talks and honorarium and money that comes from activities that I am involved in.

Q. All right. The Federal Government activities, can you generically describe what those are?

A. Currently most of that is for the Department of Defense. And it deals with effects in the respiratory system and the lungs of exposure to chemical and biological materials.

Q. Weapons?

A. No, not weapons currently. We have done some with chemical weapons in the past.

Q. Okay. Can you just be a little more specific in terms of, when you say exposure to chemical or biological agents, is that for the

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Department of Agriculture?

A. No, this is for the Department of Defense.

Q. Oh, Defense. All right. And be a little more specific with me on what that work involves.

A. The chemical and biological agents I can't discuss. It's classified work.

Q. Okay.

A. The other work that's non-classified deals with troop exposures to various types of agents boy the Department of Defense, such as pesticides and munitions and even such things as sand in a desert environment, such as Iraq.

Q. Are these in the nature of risk assessments that you are doing?

A. Yes.

Q. All right. And approximately what percent is the government work, including classified and non-classified work?

A. Well, I would say out of the 40 percent it varies quite a bit from time to time. I would say on the average it runs about 15 percent.

Q. Okay. Now, in terms of the site

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assessment work that you do -- withdrawn.

In terms of Thomas & Thomas' clientele, are there any environmental groups that are clients of Thomas & Thomas?

A. There have been in the past, not currently.

Q. Okay. What have been the past environmental groups that have been clients?

A. And I don't know if they characterize themselves as environmental groups, but American Wildlife Federation, for example.

Q. I think they would. Any others?

A. There have been some others, but I don't know which ones specifically they were. I did do some review and so forth. Let's see -- what's the name of the group in Washington? The Resources Defense Council.

Q. Natural Resource Defense Council?

A. Yeah.

Q. What was the nature of the work you did for NRDC?

A. That was review work.

Q. In about what time?

A. You mean --

Q. What time period, sorry?

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A. It's been off and on over the years. I had done some reviews for them in the late 1980s. Probably even the mid-1980s. And the early 1990s.

Q. What subject matter?

A. Well, the most recent subject matter dealt with pesticide issues and pesticide exposure, particularly in infants and children.

Q. And who did you work with at NRDC?

A. I don't remember.

Q. Do you know an Al Myerhoff?

A. Yes, I do.

Q. How do you know Mr. Myerhoff?

A. I think we've met.

Q. Is he a former or did he work for NRDC at one time as far as you know?

A. I don't know. I recognize the name. I think we've met. I assume that he did. I don't know.

Q. Okay. And were you assessing for NRDC the impact of pesticide exposure on worker populations?

A. Typically what they would do is ask me to review some document they had written and provide to them comments, and that's what I did.

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Q. All right. Why don't we go off the record. We need to do a tape change. So we can take a short break.

VIDEO TECHNICIAN: Going off record at 11:08:45.

(A recess was taken.)

VIDEO TECHNICIAN: Going back on the record at 11:10:31.

BY MR. CRANDALL:

Q. Okay. Dr. Thomas, going -- have we fairly well but generally characterized the breakdown of business for Thomas & Thomas in 1998?

A. Yes, I think that's a good generalization.

Q. Okay. In terms of the work that you expect for the future, is it correct that the site assessment work is something that you expect to be ongoing into next year and beyond?

A. Yes.

Q. What about the work for Jones, Day?

A. Well, I would assume so.

Q. And what about the database work?

A. Yes.

Q. And what about the work for the Federal Government?

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A. Yes.

Q. Okay. I want to touch on the extent to which you have been deposed and testified in tobacco-related litigations. And I recognize your memory may not be perfect and counsel did provide me with certain deposition transcripts last night which I can refresh your recollection with, if necessary.

But can you just tell me from your memory how many tobacco-related trials you have testified in and when?

A. I have only testified in one tobacco related trial, and that was Karbiwnyk in the State of Florida.

Q. And when did that occur?

A. That was this past year.

Q. In your report you talk about reviewing some evidence in connection with that case. And you have a date of October, I think, of 1997, which is on page 6 of Exhibit 1. Is that the trial you are talking about?

A. Yes, that's the one.

Q. And do you have transcript of your trial testimony available?

A. I don't have it available.

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Q. You were never given it?

A. I think I actually do have a copy of it in my files.

MR. CRANDALL: Okay. I'd ask that that be produced, too, Counsel.

MR. RYERSON: We will take that under advisement.

MR. CRANDALL: Okay.

BY MR. CRANDALL:

Q. Do you remember how many days you were on the stand?

A. I believe it was one day.

Q. For both your direct and cross-examination?

A. Yes.

Q. And that is the only time you have actually testified in court on the tobacco-related issues?

A. Yes.

Q. But you have had your depositions taken on tobacco-related subjects, correct?

A. Yes.

Q. All right. Aside from this one, there was one in the State of Minnesota; is that right?

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A. Yes.

Q. And then there was one in the Florida case as well, correct?

A. Yes.

Q. What are the other ones that you remember where a deposition has been taken on a tobacco-related subject?

A. As you had mentioned, Minnesota, Florida, Mississippi. Those are the three Attorneys General cases.

Q. Okay.

A. And then Engle, which is a Florida case, class action case.

Q. All right.

A. There may be some others, but I don't remember. I'm not sure.

Q. So the three AG actions that you remember are Mississippi, Florida, and Minnesota?

A. Yes.

Q. And then there's the Engle case class action in Florida?

A. Yes.

Q. And then there's this case; is that right?

A. Yes.

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Q. Are there any upcoming depositions in other cases of which you are aware?

A. Not that I'm aware of.

Q. All right. Have you written or were you in the process of writing any reports in other tobacco-related litigations?

A. No.

Q. When was the last time you were deposed in a non-tobacco related matter, in other words, a deposition of any kind excluding tobacco?

A. About '94, 1994, for the U.S. Department of Justice.

Q. That would have been in connection with the Oregon litigation?

A. No, that was actually an administrative hearing or administrative case involving vaccine litigation. I didn't include that in there because those are more administrative types of hearings. They are under a special master rather than a typical court.

Q. Okay. What was -- do you have a copy of that -- withdrawn.

Did you say that was a deposition or an administrative hearing testimony?

A. Well, I was deposed in that. You'd

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asked when I was deposed last.

Q. Right.

A. And that was -- and I may have been deposed in Davidson, although I don't remember.

Q. And what was the nature of your testimony in the vaccine litigations, or I should say the vaccine administrative hearing, I guess?

A. Yes, it was an administrative hearing, that the effects seen in brain tissue in the infant in question -- and I don't remember the infant's name that this was surrounding -- was -- the pathology on the brain was not due to exposure to mercury, as had been indicated, but was due more than likely to exposure to heroin. That was based on the analysis of the pathology.

Q. All right. Was this a tort claim of some sort that was brought?

A. Yes, this is under -- and I'm not an attorney -- but this was -- this is under a vaccine litigation or vaccine tort law that the government will compensate people injured under childhood -- under the Childhood Vaccine Act.

Q. And so the government had been sued under that statute and you were testifying on behalf of the government regarding the causation

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of the brain damage from an infant?

A. Well, it is not as much causation as what the pathology appeared to show.

Q. All right. And in that case the pathology, in your opinion, appeared to show that it was something other than the effects of vaccine?

A. Yeah, the plaintiffs were claiming that the government's vaccine was contaminated with mercury.

And I had reviewed the brain pathology, including the actual pathological slides, and based on that and my knowledge of mercury pathology had come to the conclusion that it was not characteristic of pathology for mercury, which is quite unique, but was more than likely due to an agent such as heroin.

There were indications that heroin had been given to the baby as well in the baby's milk.

Q. Okay. And do you remember what the nature of your consultation was in that case, approximately how much?

A. I'm sorry, you're asking how much it was?

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Q. Yes. In other words, was this a Thomas & Thomas consultation on behalf of the government?

A. Yes.

Q. And what was -- and what was the approximate amount of that consultation fee?

A. I don't remember exactly. My guess was it was less than 10,000. Maybe 15,000.

Q. Why don't we go off the record for a second.

VIDEO TECHNICIAN: Going off record at 11:20:15.

(The luncheon recess was taken at 11:20 a.m.)

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AFTERNOON SESSION

VIDEO TECHNICIAN: On the record at 12:03.

EXAMINATION (CONTINUING)

BY MR. CRANDALL:

Q. Dr. Thomas, I want now to ask you some questions with respect to your expert report. So if you could have Exhibit 1 in front of you while I do.

The first question that I probably should have covered earlier, but you're the director of the Internation Center for Environment and Health of Medical Service Corporation, International; is that right?

A. Yes.

Q. And how long have you been in that position?

A. Approximately four years.

Q. Is that since you left the National Academy of Sciences?

A. Yes.

Q. All right. And what do you do as the director? In other words, what are your responsibilities?

A. Oversee various types of projects,

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both the administrative aspects of the project, often reviewing the science as well.

Q. What is the Medical Service Corporation, International?

A. It's a private firm.

Q. Is it publicly held or private?

A. No. It's private.

Q. All right. And who are the owners?

A. George Contisis is the owner of Medical Services Corporation. There may be others, but I am not aware of them.

Q. All right. And in terms -- are you familiar with the annual revenues of Medical Services Corporation?

A. No, not really.

Q. Okay. Are you paid a salary as the director?

A. Yes.

Q. All right. And is the -- how do you apportion your time between Thomas & Thomas and Medical Services Corporation?

A. I spend time on both activities. It varies from time to time. More recently -- I was trying to think of a way to put it -- in the last four years, it's been probably 75 percent with

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Medical Services Corporation, 25 percent with Thomas & Thomas.

Q. All right. Now, in terms of what Medical Services Corporation does, you'll remember the questions I was asking you with respect to consulting work and things of that nature. Does Medical Services Corporation itself do that or is it a completely unrelated field?

A. No, it does some of the same types of work.

Q. Keeping in mind our discussion this morning, do you have any idea of the breakdown of the services that Medical Services Corporation has provided to industry and the government and other entities over the last four years?

MR. RYERSON: Mr. Crandall, just to clarify your question, you're asking about Medical Services Corporation, not the International Center for the Environmental and Health; is that correct?

MR. CRANDALL: Well, that's a good question.

MR. RYERSON: I thought it was an ambiguous. That's why --

MR. CRANDALL: Yeah, it is ambiguous because I was ambiguous in my understanding.

BY MR. CRANDALL:

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Q. The International Center for Environment and Health is a part of Medical Services Corporation International; is that right?

A. That's correct.

Q. All right. And that leads to two sets of questions. But first with the Medical Services Corporation overall, when I asked you that question a moment ago about what it did, were you talking about Medical Services Corporation overall or the International Center for Environmental and Health of that corporation?

A. Medical Services Corporation, International has broader things that it does. It certainly does the things that I just mentioned, but those are more contained within the International Center for the Environment and Health.

Q. So -- and again this is roughly speaking, the International Center for Environmental Health roughly does the same type of things that Thomas & Thomas does?

A. Yes.

Q. Okay. Over the last four years, can you give me just an idea of what percentage of business from the International Center is risk

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assessment and other things?

A. The International Center has done database work and site assessment work. It does less database work than Thomas & Thomas Technologies. It does more work that's associated with public health generally than Thomas & Thomas and with policy.

Thomas & Thomas tends to be more heavily scientific, whereas Medical Services Corporation and the International Center tend to focus more on public health issues and assessments concerning some public health issue.

ICEH, which is the International Center, does not do as much site evaluation work as Thomas & Thomas does.

Q. Okay. You had a shorthand the way. It sounded to me like ice age, but --

A. Yeah, it's ICEH. That's how we came up with it. It's just the acronym, ICEH.

Q. Okay. Okay. Then does -- how much of ICEH is site assessment work for industry?

A. It's -- and again, these are just rough estimates, but I would have to say the site assessment work, considering that broadly, it's probably about 40 percent.

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Q. All right. And then what's the remaining breakdown of the ICEH?

A. Well, risk assessment has been a major area, and that would constitute -- and I'm using risk assessment broadly, particularly as it's applied to public health issues -- would probably make up about another 40 percent, maybe 30 percent because there is some database work that ICEH has done or is doing.

And the last, the remaining area would be educationally-related materials and preparation, such as courses. Taught a course for the World Bank.

Q. Okay. And in terms of the 40, approximate 40 percent site assessment, is that principally industry site assessments?

A. It's about 50/50. It's about half industry and half, either government or donor organizational-related.

Q. When you say donor organization-related, what does that mean?

A. Means like the World Bank or the United Nations or World Health Organization.

Q. And what is the breakdown of risk assessment in terms of private industry versus

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other entities?

A. All of that is done for mostly donor organizations, the World Bank and United Nations, development programming groups such as that.

Q. In terms of that work, is there a way to shorthand the characterization of what you do for the donor organizations? Generally speaking, what does ICEH do for the World Bank, for instance?

A. Maybe a very brief example would help. A project the World Bank sponsored -- has been sponsoring a project in Thailand to do a risk assessment of the contaminants within a river in Thailand to try to clean up the river.

It's a major river that runs through Thailand. And there is about 2 million people that subsist off the river and they want to reduce the pollution. And so the World Bank pays for that type of work.

Q. Okay. What are the revenues -- the annual revenues of ICEH between 1994 and 1998, approximately?

A. That's really hard to estimate because it's not typically separated out as a separate -- I would say it's in the several

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hundred thousand dollars area. It could be over a million dollars.

Q. Okay. So in terms -- and this is not talking about Medical Services Corporation in general -- this is just the International Center?

A. Yeah. Well, the problem is the International Center shares employees with Medical Services Corporation. And funds are shared and so forth.

And they are typically not separated out. So that's why it is difficult to estimate specifically how much comes to ICEH and how much comes to MSCI.

Q. Okay.

A. But I would say that, you know, it's certainly in the several hundred thousand dollar area for the International Center, but that's about the best I could do.

Q. Okay. And that would be on an annual basis since you've been there?

A. Um-hmm.

Q. Al right. Now, MSCI then in general does what that is different from what ICEH does?

A. They do a lot of what some people would call public health support work, such as

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developing and building hospitals, carrying out programs for, say, an organization like the Centers for Disease Control in some country where they were looking at disease rates in a population, such as vector-borne diseases -- malaria is an example. And so they may have a project in Africa looking at malaria rates in a certain group of people.

Q. Is most of MSCI's work government-sponsored?

A. A large part of it is government-sponsored. Or -- actually, a large part of it is a donor organization-sponsored. You know, a lot of the donor organization money comes from the Federal Government or from other governments.

Q. Okay. Let's turn to -- well, before I leave the subject of what you do, have we covered -- is it true that ICEH and Thomas & Thomas are the two principal areas where you derive your income?

A. Yes.

Q. All right. Are there any others that I've left out?

A. Well, there are minor areas such as

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honorarium and that type of thing that most professional people receive from talks and it makes up a very small portion, and most of that I actually turn over to either ICEH or to Thomas & Thomas.

Q. Okay. From reviewing your deposition transcripts and looking at your report, it seems that one of the principal bases of your opinion -- and correct me I'm wrong -- has to do with the differentiation between what you term the causal relationship between tobacco and smoking and what work has been done with epidemiological studies. Is that a fair characterization of one of the principal points of your opinion?

MR. RYERSON: Object as to form of the question.

You may answer.

THE WITNESS: Well, I don't know quite how know how to answer that question. Maybe you could restate the question and I could try to answer it.

BY MR. CRANDALL:

Q. Okay. All right. You have experience both with toxicology and epidemiology; is that right?

A. Yeah, and pathology.

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Q. All right. And you -- well, let's look at -- maybe the best way to do this is if you look at page 2, the last paragraph before heading Animal Studies.

A. Yes.

Q. The sentence that comes to mind for me is "In the absence of an understanding of the mechanism of a disease, epidemiology alone is not capable".

A. I'm sorry. I was looking at the wrong place. You are looking at the last paragraph before animal studies.

Q. Right.

A. Yeah.

Q. Okay, and that first sentence I'm focusing on. "In the absence" -- I'm just going to read it in the record. "In the absence of an understanding of the mechanism of a disease, epidemiology alone is not capable of establishing that an agent is a cause of a particular disease."

That's -- first of all, that's what it says, correct?

A. Yes, that's what I wrote.

Q. And that is your opinion; is that right?

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A. Yes.

Q. Is that opinion that epidemiology alone not capable of establishing -- well, withdrawn.

Is that statement well-recognized in the field of science?

A. Yes, it is.

Q. Would you say that there is universal agreement, as far as you are aware, that that statement is true?

A. I can't speak for other scientists, but generally within most of the scientific community, I would say that that is an accepted principle.

Q. All right. And are there any scientists that you are aware of who disagree with that statement?

A. It -- a lot of it depends on how the word "cause" is defined. But if you define cause in the way that I typically define it as a scientist, I actually offhand can't think of very many people that would disagree with this statement.

I can't -- there's nobody that comes to mind that would strongly question that based on

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the way I would define cause.

Q. How do you define cause?

A. Well, as with a lot of these types of words, this can have several definitions. The one that scientists typically use requires such things as an understanding of the mechanism, which is what this sentence says.

And if you look at statements of other scientists, even of the Surgeon General in '64, there is a distinction made between a statistical association that you often find in epidemiology and understanding in the laboratory using an animal model of what the mechanism is.

So based on that definition of cause, where you understand such things as the mechanism, you have an adequate model, animal model to be able to examine a disease, most scientists would agree with this statement based on that.

Q. Okay. Now, this gets into your field that is not mine. But is an animal model necessary for understanding a mechanism of disease or could it be provided through other avenues?

A. It really is necessary to have a laboratory animal model to understand the mechanism of disease.

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Q. All right. And when you talk about mechanism of disease, you are talking about knowing exactly how the agent works in the human body to produce the result?

A. That's basically what I'm describing.

Q. Now, is there any relationship, statistical relationship that would -- in epidemiology that would lead you to -- I guess from what you said the answer going to be no, but let me ask it anyway.

Is there any strength of associational relationship between smoking and cancer that would ever lead you to conclude that there is a cause, causal connection, in the absence of knowing the mechanism of the disease?

A. I'm not -- your question is a little hard to understand. Maybe you could rephrase it.

Q. I will. Epidemiology depends, as I understand the science, in statistical associations between --

MR. RYERSON: Can we go off the record for one second.

VIDEO TECHNICIAN: Off the record at 12:43:05.

(A recess was taken.)

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VIDEO TECHNICIAN: Going back on the record at 12:24:05.

BY MR. CRANDALL:

Q. I'm not sure where we were, but I'll give you a new question anyway. As I understand the field of epidemiology, it involves trying to control for factors and to isolate relationships such that there is a statistical significantly relationship that can be identified between a substance such as tobacco or smoking and an effect such as cancer; is that true?

A. Well, the field of epidemiology is to develop statistical associations between some activity and a disease. And I think that's similar to what you're saying.

Q. Okay. Is there any situation where you could conceive of where the relationship would be so strong that one could then say, in the absence of knowing the mechanism of disease, that in fact there was causation?

A. Well, mechanism and some other aspects of it. Based on simply a statistical association, as I've indicated this, epidemiology alone is not capable of establishing the cause of the particular disease. In other words, the

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statistical association is not adequate.

Q. No matter how powerful?

A. Yes.

Q. No matter how many factors are controlled for?

A. Yes.

Q. Okay. So even if an epidemiological study were undertaken that controlled for as many variables as the human mind could control for and there were, let's say, an extremely powerful correlation between smoking and the incidence of cancer, in your opinion you would still not say that smoking is the cause of cancer in the way you've defined it?

A. What I'm saying is that, as you are describing, that may be a very strong statistical association, but still that would not tell you the cause.

Q. And the distinction you're making -- is this distinction -- and I realize I'm giving you an extreme situation where there is an extremely powerful relationship statistically and a wide array of known factors that are controlled for.

But in that situation, is the field

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of science, as you understand it, in agreement with what you just said that no matter how powerful the correlation one can never conclude that there is causation?

A. Well, first of all, you are making this a very broad statement.

Q. I am.

A. And I think we've already, I've already indicated that that first sentence is correct, which is that epidemiology alone, regardless of the number of factors you control for, is still not capable of establishing causation the way I define causation.

Q. Okay. And maybe -- let me go back and go at it this way. Is the way you define causation universally accepted in this field of science?

A. Yes.

Q. Okay. And I know there was a lot of back and forth maybe ad nauseam over the use of causation in other contexts, say, the Surgeon General's report or in the vernacular.

For instance, I think if you went out on the street and asked someone like me does smoking cause cancer, I would say, sure, it does.

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But that type of causation that I'm talking to you is not the type of causation you are using in these opinions, correct?

A. That's correct.

MR. RYERSON: Excuse me. Objection as to form. Vague.

You may answer.

THE WITNESS: Basically what I've said is if you define causation based on some strength of an association, if you say, well, if it's a stronger association, to me that's causation, that's one way to define it. And that may be the way that somebody on street would define it. That's not how I define it.

BY MR. CRANDALL:

Q. Okay. All right. And I recognize that. And the question is, there are no reputable scientific authorities that would define it the way the man on the street would define it; is that right?

A. No, that's not what I said. There are -- depending on how you define reputable organizations, there are various organizations that make pronouncements, including, you mentioned the Surgeon General and other organizations that

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make pronouncements on public health.

And they may use different definitions of causation. Sometimes they describe those; sometimes they don't.

If they're using a different definition of cause than scientists use it in the strict sense of science, they may come to a different conclusion than I would and other scientists would.

Q. What are the principal texts, to your knowledge, that support the statement that you have made on page 2 that before understanding of the mechanism of disease, epidemiology alone is not capable of establishing that an agent is a cause of a particular disease?

A. Well, you mentioned the Surgeon General. The Surgeon General is not a text, but that's -- I mean, clearly in the landmark report in 1964 made a distinction between the two and made it clear that when they talked about cause, they were referring to the strength of the statistical association.

And it indicated that nobody on the committee was using "cause" in the strict sense of the word. There are numerous textbooks after that

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time that have dealt with cause in detail.

Q. Which would be the most -- the best ones, the most authoritative that come to mind?

A. Well, authoritative -- I mean, there is a lot of very good textbooks that deal with it. There have been a lot of publications in the last few years dealing with issues of cause.

When I was taking pathology in graduate school, I used Robbins' Pathology. And Robbins' Pathology deals with cause in this manner. It's a general textbook.

There have been several publications, even in the last few years, talking about what strength you have to have in various types of study to understand cause, particularly multi-factorial disease, and some of these are listed in this, in the back.

Q. Okay. I don't want to go through this, the list again, the 14-page list again, but maybe having gone through it, agonizingly slowly once, we can go through it a little faster. If you just flip through and pick out --

A. Suppose I just give you one that deals with it that's a recent one.

Q. Okay.

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A. I remembered seeing it when we were going through this. Sutter, 1996 is a recent publication dealing with cause. It's on page 13.

Q. Okay.

A. And there's a lot of references within that. And that talks about issues of cause and the Koch's Postulates.

Q. I'm sorry. When you said Koch's Postulates, what did you mean there?

A. Well, it indicates in the title -- title is Assigning Causation and Disease Beyond Koch's Postulates. And it talks about the application of Koch's Postulates to understanding, quote, "the cause of the disease."

Q. Okay. But I think elsewhere -- and this is again switching subjects -- well, it's not switching subjects, but you recognize, I think, on the very next page of your report that from the perspective of public health that it's not necessary for officials to understand the cause of disease in order to take action to protect the public health. Is that also your opinion?

A. Yes.

Q. Why do you hold that opinion?

A. Well, I think that's clearly an

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informed opinion that a scientist would have that works in this area, recognizing that as a scientist I do want to know this information in order to assign cause the way I'm defining it.

But yet public health officials have a responsibility to act and protect the public health, and often have to do that in -- with a lack of scientific information.

Q. Now, you don't mean to suggest in -- in the last sentence you said a lack of scientific information. You mean with a lack of complete scientific information, I take it. You don't consider epidemiology to be unscientific, I take it.

A. No.

Q. Okay.

A. I didn't say that.

Q. Okay. No, I know you didn't, but you said they have to take action without a lack of scientific information, and I wanted to clarify that -- put a complete on it; isn't that what you meant?

A. There's varying degrees of scientific information. And public health officials often have to take action without having a complete set

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of scientific information or even a more complete set.

Often they will take action with fairly incomplete information. But it's their responsibility to try to protect the public health.

Q. What are the types -- and this is a general question -- but what are the types of information, based on your knowledge and experience, upon which public health officials have in the past taken action to protect the public health?

A. Well, we had talked about epidemiology. Epidemiology is a -- I would define as a statistical science. And it tells us about the relationship between the incidence of disease in population and possibly various activities that the population is involved in, whether it be taking pharmaceutical agents for treating disease or it be exposure to some environmental factors or smoking or other lifestyle issues.

Q. Aside from epidemiology?

A. And epidemiology is often used by public health officials to say, well, I see a statistical association, and I think it's

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important to try to improve public health. So based on that association alone, we will take an action.

Q. And aside from epidemiology, what are other sources of information that have, in your experience, led public health officials to act without knowing causation?

A. Well, toxicologists often supply information to public health officials, and I would include, for example, the Food and Drug Administration as being public health officials.

A lot of my colleagues are employed either directly or indirectly for the pharmaceutical industry. They carry out studies and provide that information to the Food and Drug Administration for approval of a pharmaceutical that may go on the market. That's a public health decision.

The Food and Drug Administration may approve a pharmaceutical going on the market without really understanding how it works. But they have run enough studies that they know that it appears to be efficacious for treating a particular disease, but still they may not know how it works and that may be the basis of a lot of

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future research.

Q. Okay. Aside from toxicological studies, what other information do public health officials sometimes act upon?

A. Well, they use a lot of information. They use economic information from economists, which tells them how much money they have to take a particular action.

And they use information from engineers. If it's air pollution and they want to, say, change the way air is filtered in a building, they may consult a group of engineers to deal with air filtration systems.

Mathematicians, attorneys. There's a lot of different people that provide input to public health officials and not all of them are scientists.

Q. Okay. Have you given thought to the relationship between your definition of causation and legal causation?

A. No, not really.

Q. All right. I take it in the course of your career you have been often posed questions that go like this: Dr. Thomas, in your opinion is it more likely than not to a reasonable medical

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certainty. Have you been asked questions with those prefaces attached to it in your career?

A. From time to time. Similar types of questions.

Q. All right. In your opinion, if you are asked that question with respect to tobacco smoking and cancer -- let me do so. Is it your opinion that to a reasonable medical probability that there is no demonstration of the causation of tobacco smoking and cancer?

A. I don't know how to answer that question because it's using causation in a different way than I use it.

I don't know how to answer your question.

Q. Okay. Why is it using causation differently than you use it?

A. Because it -- what you're implying in the question is that the statistical association that we see between tobacco smoking and lung cancer is sufficient to establish causation, and what I'm telling you is that based on the way I define it, it's not.

Q. Okay. And I didn't mean to suggest -- I actually was asking the question to

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see what your response would be. But you just answered what I was getting at.

In other words, if I ask you any question that focuses on whether tobacco causes cancer, you would answer no because under your definition of causation it requires an element that's missing.

A. That's correct.

Q. All right. In your opinion, does the scientific community all ascribe to what you just said?

MR. RYERSON: Objection. Asked and answered.

THE WITNESS: No. I don't --

MR. RYERSON: You may answer anyway.

BY MR. CRANDALL:

Q. Well, I'll rephrase it, though. Are you aware of other scientists who would answer yes to that question whose reputation you consider to be reasonable and experienced?

A. I know of other scientists that are not particularly in the area that I work in that may answer yes to the question, just as I know scientists that would answer as I do, no.

Q. So is there disagreement in the

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scientific community over this issue of whether it can be stated that, as a legal matter, tobacco causes cancer?

MR. RYERSON: Excuse me. I am going to object to the form of the question.

THE WITNESS: Yeah, I wasn't talking about as a legal matter. I was talking about scientists. I -- the scientists that I know that look at this from the same standpoint that I do with a strict sense of cause would give you the same answer I give you.

There are other scientists, because we are using scientists broadly, that would use cause in a different way. An epidemiologist, for example, would say -- well, may say, may use cause because there is what he feels a strong statistical correlation. For me, that would not be adequate.

Q. Okay. Do you believe, and this is moving off into your knowledge of the correlation, do you believe that there is a strong statistical correlation between smoking and certain diseases?

A. There is a strong correlation between smoking and some forms of lung cancer.

Q. Okay. And which forms of lung

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cancer?

A. Well, the one that's often cited is the small cell carcinoma. And the giant cell. And there are some other cell lines that the associations are not quite as strong.

It depends on which study you look at, like Squamous. And then there are some that do not appear to have either a strong or either a weak correlation. These vary from study to study, and so it's a little difficult to separate them out.

Q. Okay. When you use the word "strong correlation," what -- please define that term for me.

A. I'm only using it in a relative sense in that there have been several studies done since the 1950s that show varying correlations.

Some actually weaker, some stronger, but I can't say -- I mean, strong is a very relative term, and I'm not sure I could say whether strong is a 2 or a 5 or a 10 relative relationship.

Q. Okay. But --

A. It's just -- there's repeated studies.

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Q. All right. Well, when -- will you at trial be issuing any opinions with respect to specific statistical correlations between smoking and any types of cancer?

A. I may. I don't -- I don't know because we -- I haven't really thought in detail as to what I'm going to testify about. I certainly am going to be talking some about the correlation between laboratory animal studies and epidemiologic studies.

Q. Okay. Well, I guess the question is -- we'll get to that in a minute. But right now I'm focusing on, if I can, can you give me any more detailed opinion about the strength of the relationship between smoking and lung cancer on any studies that you are aware of, or are you limiting your opinion to a word called "strong"?

A. Well, I don't understand your question.

Q. Well, you would agree, would you not, that when epidemiological studies are done, there is a control, there is a relationship factored in them, then there's -- usually the strength of the correlation is analyzed from a statistical viewpoint with error and things like that;

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correct?

A. Um-hmm, that's correct.

Q. All right. And as you sit here today, are you able to tell me what in particular those correlations are with respect to smoking and any form of lung cancer?

A. I haven't gone back and specifically pulled those out. There are a wide range of numbers of incidence, depending on which report. I mean, we are talking about a fairly large body of information.

Q. I understand that.

A. And I'm not quite sure what you're asking me about that body of information except that --

Q. Okay. Let me do it this way.

A. Yes.

Q. All right. You do believe there is a strong statistical relationship between smoking and certain forms of lung cancer; is that correct?

A. That's correct.

Q. One being small cell?

A. Um-hmm.

Q. You also believe it's strong involving giant cell?

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A. Um-hmm.

Q. And you also believe that although you don't know the exact other studies, there are other cell lines for which there is a strong correlation as well?

A. Well, there are other cell lines for which there is a correlation which vary depending on the study.

Q. Are there some of those studies for which there is a strong correlation?

A. Yes.

Q. All right. Now, I want to go through with you other forms of cancer, aside from lung cancer. Is your opinion that there is a strong association with smoking and other forms of cancer or not?

A. I don't -- if you want to ask me about a specific cancer, I can tell you the -- strong, again, is a relative term. There are associations with other forms of cancer.

Whether you want to call it strong or weak or medium, these are all relative terms. There's certainly some associations with some other forms of cancer.

Q. Okay. And I will try to do it if you

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can't do it sitting there. My question to you would be, can you tell me in your opinion what the -- what your opinion is with respect to other forms of cancer and the strength of the association between smoking and those cancers?

A. There are some cancers where there is a larger association and there are some where there are weaker associations.

Q. Okay. Which are those?

A. Such as kidney cancer is a somewhat stronger, but it's not a strong one. And again, it varies from study to study. Some don't find any correlation.

Q. And my opinion is, you are -- well, let me ask you this. When you testify at trial, are you going to be offering opinions that involve your epidemiological expertise?

MR. RYERSON: Objection as to form.

BY MR. CRANDALL:

Q. Well, I'll withdraw it. On your introduction you say you have training and professional experience in toxicology, pathology and epidemiology, correct?

A. Yes.

Q. And what I am trying to get out from

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that professional experience is whether your opinions at trial will delve into the strength of the association between tobacco and various forms of cancer.

A. It may as it deals with the issue, for example, of causation.

Q. Okay. And that's why I'm trying to explore with you the specific relationships of specific cancers. So in your opinion is there a strong or a weak association between smoking and kidney cancer?

A. Well, the problem with your questions is your questions require a conclusion based on several studies which do not all give the same answer.

And I would say for kidney cancer, some studies show no relationship and some studies show a weak relationship. I can't offhand think of any that would show any more than just a weak relationship.

Q. And when you say weak relationship, again, can you define that term for me.

A. Well, like I say, I am using it as a very relative term. We are talking about relative risk ratios of somewhere around -- less than 2,

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maybe less than 3. Certainly less than 2 are considered weaker relationships.

Q. All right. What is a relative risk ratio?

A. Well, the simplest way to describe it is the ratio of disease to the person that's had the exposure as opposed to -- rather, the amount of disease in the person that's had the exposure over the disease in a control group.

So if it's greater than 1, then there's an increase in the disease. If it's 1, there's no increase in the disease.

Q. And at what levels on risk ratios is there a strong association, in your opinion?

A. To what?

Q. Well, on any given cancer where there is a relationship assessed between tobacco or smoking and that cancer, what is the risk ratio number that you would consider to be strong?

A. Like I say, I am using it as a relative sense. For -- I think most people that look at epidemiologic studies feel that -- most scientists feel that relationships of less than 2, maybe 2-1/2, sometimes even 3 depending on the extent of the confounding variables, are weaker

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relationships.

Those that are above are -- if you want to use stronger relationships. But like I say, it depends a lot on the study because there's tremendous variability within the study, and I'm not using this in a strict sense; I am using it in as a general sense.

Q. Okay. But I guess the question is, you do have -- well, do you have opinions on the statistical relationship between smoking and certain types of cancer?

A. Yeah, on the statistical relationship.

Q. Okay. And that's what we're going through. So I take it that your opinion is that there is a weak relationship between smoking and kidney cancer.

A. It depends on the study. In some there are no -- there is no relationship.

Q. Okay. But, though, have you gone through those studies to discern whether some are more reliable than others or whether some were more complete in terms of accounting for variables than others in order to assess which ones you believe?

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A. Yes.

Q. Okay. And with respect to kidney cancer, which of those studies do you believe and what are the results that you are ascribing to?

A. I don't know. I didn't prepare to go into that for this deposition.

Q. All right. Can you do the same thing with respect to laryngeal cancer?

A. Yeah, laryngeal cancer is another one that, depending on the study, again, it shows a relationship in some of the studies. Some are probably negative.

I do remember some negative ones. Some are weakly positive. Some are greater than if we were tentatively using, say, 2 to 2-1/2, the risk ratio would be larger than that.

Q. So is your opinion that there is a strong association between smoking and laryngeal cancer or a weak association?

A. It's my opinion that there is an association which varies from study to study. It may be weaker in some and stronger in others.

Q. Well, do you have an opinion as you sit here today as to whether the relationship between smoking and laryngeal cancer is strong or

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weak?

A. Like I say, it depends on the study.

Q. Well, I am asking --

A. It depends on how you want to analyze the studies. Do you want to add them all together and divide by the number of studies or -- I don't know how to answer your question.

Q. Okay. Well, maybe the answer is you don't have an opinion, but, Dr. Thomas, I am entitled to get your opinion if you have one in advance of the trial.

And my question again is, if you do have one, I just want to know whether you have an opinion as to the strength of the associational relationship between smoking and laryngeal cancer.

A. Well, like I say, there is an association between smoking and laryngeal cancer, and in some studies it's a strong association and in others it's weak. It depends on the study.

Q. Okay. So you have not formed an opinion as to whether some studies are better than others to as to ascribe to the strength of the associational relationship?

A. That's not what I said. I have gone through those studies on laryngeal cancer and some

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are better than others.

Q. And which are the good ones?

A. I don't know if I could pick them out. There are probably some in this list, but we've talked about the Surgeon General's reports. The Surgeon General's reports have gone through and summarized those.

Q. Okay. But you are unable to tell me sitting here today which are the strong ones and which are the weak ones in your opinion?

A. I haven't gone back and reviewed them for this deposition. I could have if I had done that.

Q. All right. And how about for chronic obstructive pulmonary disease, do you have an opinion as to whether there is an associational relationship between smoking and that disease?

A. In several of the studies there is a statistical association between smoking and COPD.

Q. Is it strong or weak?

A. Again, in a lot of studies it's strong. Some studies are weak. There is an association, but it will vary from study to study, and depend on other factors within the study.

Q. Okay. So is it -- do you have an

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opinion sitting here today whether or not the associational relationship between smoking and COPD is strong or weak?

A. Like I say, those are relative terms and there is a statistical association. If you used a cutoff of 2.0 for relative risk, several of them would be strong.

Q. Do you use a cutoff of 2.0 for relative risk?

A. For what?

Q. For issuing opinions? For giving your opinion in this case?

A. No, I said if we did, that's -- as I mentioned a few minutes ago, people in looking at the strengths of statistical associations will sometimes use 2 or 2-1/2 or sometimes 3.

I said if I used 2, there are several of them that are above 2. If you used 3 as a cutoff, there would be less above 3.

Q. Okay. There is a phrase, Dr. Thomas, if wishes were horses -- which I'm sure you are familiar with. And what -- I understand that if certain phrase are used.

But I'm trying to drive at your opinion in this case with respect to those

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relationships if you have one. And if you don't, you can tell me that you don't. But if you do, I'm entitled to know what they are.

And my question to you is, do you have an opinion as you sit here as to whether there is a strong or weak relationship between smoking and COPD?

A. Like I say, my opinion is that there is a statistical association which has been clearly demonstrated in several studies. And in several of them the association is strong.

Q. Do you ascribe to the strength from those studies?

A. Well, I -- like most scientists, I try to look the number of studies, not just a single study, but the number of studies. So if more of them are strong than -- if you wanted to use that relative term, you could say that that's a stronger association.

Q. I don't want to use the term if you don't want to use the term. I mean -- and I mean that. In other words, if you don't have an opinion as to the strength, that's all you need to tell me is I have no opinion.

But if you do have an opinion as to

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the strengths of the associational relationship, then I'm entitled to find out your opinion about it under whatever standard you employ.

MR. RYERSON: Objection. I think that he has given you an opinion.

But you may answer the question.

BY MR. CRANDALL:

Q. Okay.

A. Well, like I say, I think I've answered this about three times now that there is an association and the association depends on the studies. Many of the studies are above 2 if we use that as a cutoff; there's less above 3.

How, quote, strong it is depends on -- that's a very relative term. That's not a scientific term. It just depends on how you define it.

There is an association. And it is repeatedly found in epidemiologic studies. I think that's the answer to your question.

Q. Well, that's the answer to part of my question. But the other part of my question is whether you yourself have an opinion as to the strength of the relationship.

And when I ask you that question I

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keep getting "if" in the answer. You say if you use a relative risk ratio of 2 or less than 2, and if you use less than 3.

My question here, though, is do you, in assessing relative risk -- where do you place the number, if you do, between a weak study and a strong study on the relative risk ratio?

A. It depends on the study. With the number of studies that have been done, as I indicated, several of them show an association and several of the associations are above 2.

That -- I think that indicates a clear statistical association. But if -- I couldn't answer it any further than that unless you showed me the specific study that you want me to look at.

Q. Okay. Well, you haven't reviewed the COPD studies in preparation for your testimony today, have you?

A. I haven't gone through them in detail for preparation for this. I did look at them for the preparation for the expert witness report. I didn't review them in detail for that, either.

Q. Okay. And you are unable to tell me in your opinion today whether or not you believe

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there is a strong or a weak correlation between smoking and COPD?

MR. RYERSON: Objection as to form. You may answer.

THE WITNESS: Well, like I say, there are several studies that are -- shows a statistical association, and several of them are above 2, relative risk of 2.

BY MR. CRANDALL:

Q. Okay. And I do agree that -- I don't want to go around and round forever. However, with all respect, I don't think you're answering the question which is your own opinion about the strength of the association.

Not summarizing what the studies say, but from your assessment of those studies in looking at the relative strengths and weaknesses of those studies, whether you yourself as a scientist, an epidemiologist, have an opinion as to the strength of the associational relationship between smoking and COPD?

A. I think I answered that. I gave you an answer that you would receive from a scientist about the studies. You are asking me for an answer that, frankly, is unscientific. That's why

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I'm having difficulty with it.

Q. Okay.

A. And I am being very specific about what I've found in studies when I've reviewed those, and I think I've tried to answer your question.

Q. Okay. And what is unscientific about my question?

A. For example, the use of a term like "strong" when we haven't defined it. And it's very relative term, which -- I mean, if it's used at all in scientific papers, it could mean something different in every single paper. And I gave you a potential definition that scientists would use and described my answer in those terms.

Q. Okay. But you didn't, I don't think, gave me the definition that you would use.

A. Well, like I say, scientists such as myself would use 2, 2-1/2, maybe 3 as the strength of -- above that would be a stronger association and below that would be a weaker, but it would depend on the study and the strength of the study.

Epidemiology studies notoriously have a lot of problems in them. And some are better than others and some are weaker than others. So

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it really depends a great deal on the studies.

Q. And you haven't reviewed those studies prior to being deposed today in enough detail to give me an answer to evaluate those studies, have you?

A. I -- if you want to ask me about from memory what specific studies there are, I can't answer that. I suppose we could go back to this list and start digging through it again and I could give you some, but I didn't go through those in the type of detail that you are asking me.

If you want to give me a study that I've read before, I will tell you what its strengths and weaknesses are.

Q. Okay. Well, I don't think from having gone through the 14-page list of references that any of those titles what give you the strength of the relationship, would they?

A. Sure.

Q. They would?

A. Yes.

Q. All right.

A. Like I say, there are -- as I was reading through it, I think I noticed a couple of the -- maybe three of the Surgeon General's

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reports which discuss these in detail and describe the strengths and weaknesses of several studies and --

Q. Well, not in the title, do they?

A. I'm sorry. I don't understand what you're talking about then.

Q. Well, you indicated that we could go back -- I thought you were suggesting that we go back through the list of references at the end of Exhibit 1 and there find the strength of the associational relationship by reviewing the titles, but --

A. No, no, that's ludicrous. No, I was talking about the individual studies. If you wanted to go back and take a look at these, there are several studies in there that talk in detail and review the epidemiologic studies, and I have gone through and read those myself.

Q. Okay. But you can't do that today as you sit here?

A. I haven't gone through and done an extensive preparation in COPD to try to answer these types of questions.

MR. RYERSON: I would just like to represent on the record that I believe you have been

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provided with copies of all the references on this list and if you have any with you that you'd like Dr. Thomas to specifically address, you are welcome to do that.

MR. CRANDALL: When did we get those?

MR. RYERSON: I believe a week before the deposition. They did not come out of this office, but I think I have a cover letter that indicates they went to Mr. Janicek on December 11th by Federal Express.

MR. CRANDALL: Okay.

BY MR. CRANDALL:

Q. Well, let's move on to emphysema. Do you have an opinion, Dr. Thomas, as to whether there is a strong or a weak associational relationship between cigarette smoking and emphysema?

A. Well, as with the others that we've discussed, there is a statistical association depending on the study.

Some studies do show a stronger relationship, as I had indicated, above 2. A lot of them fall within the 2 to 3 relative risk ratio area. I believe there's very few above that for emphysema.

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Q. And having -- have you reviewed these studies at some point in the past?

A. Yes, I have.

Q. All right. And do you consider, having reviewed all the studies, that there is a strong relationship between smoking and emphysema?

A. As I indicated, there is a relationship which -- it's a statistical relationship which depends on the studies as to its strength.

Q. And you haven't gone through and parsed them out and made your own assessment as to whether you conclude in your expert opinion that there is a strong or weak relationship, have you?

A. Well, I've actually taken a look at the ones on emphysema in detail in the past, but it's been several years ago, and looked at the relationship. So the answer is I have done that.

Q. And what's the answer to your opinion?

A. There's a large variation from study to study as to emphysema. And emphysema is a fairly wide disease within people generally, within the public. And there are a lot of potential confounders and risk factors for

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emphysema.

And a lot of those have to be separated out. If we're dealing only with smoking, many of the emphysema articles deal with occupational exposure and other types of exposure as well.

So those are some of the issues that have to be separated out in answering your question for a specific study.

Q. Okay. But you have not gone through those studies in preparation for today's deposition in order to be able to state whether you believe the associational relationship between smoking and emphysema is weak or strong; is that true?

A. Well, I can't do that in that that's not a scientific opinion. My opinion is there's an association, clearly a statistical association in many studies that varies from zero or from 1 for relative risk up through -- and a few studies above 3. And that's a scientific answer.

Q. All right. Are you saying that no scientist would give an opinion based on a review of studies of epidemiology of emphysema as to whether or not he or she believed that there was a

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strong or a weak relationship?

A. I don't understand what you mean by your question. What do you mean by a review?

Q. Well, you seem to be, and I realize we are fencing back and forth here, but you seem to be suggesting in your answers that you -- when I ask you about whether there's a strong or weak relationship between smoking and any disease, you say I can't do that, and then you go off and tell me about your review of the studies and what the studies show.

And I come back and ask you what your opinion is, whether it's a strong or a weak relationship, and you say, I can't do that because it's not a scientific answer.

My question to you is, would all scientists share your opinion that by reviewing the available epidemiological studies on emphysema, there is no way to testify as to the strength or weakness of the relationship between smoking and emphysema?

MR. RYERSON: Objection as to the form of the question.

You may answer.

THE WITNESS: That requires me answering for

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other scientists, and I certainly can't do that. If a scientist is asked, for example, as part of an FDA review of something that's to be used in an inhaler, whether his -- after reviewing the studies has an opinion of the strength of the studies as far as emphysema is concerned, and then there's a set of guidelines at which he is considering that in, then he can give you a conclusion. I could give you a conclusion under similar circumstances.

And what I've done is the best I can in trying to give you a conclusion based on a set of criteria which I think the scientific community generally uses for judging studies.

You are asking me for a conclusion on a whole set of many, many studies which I don't think you can conclude on.

You can talk about the number of studies. If you gave me a set of criteria, though, then I can base that conclusion on a set of criteria and that's what I tried to do.

BY MR. CRANDALL:

Q. Okay. So you don't think it's possible to look at a series of studies, however many that have been done on emphysema, and come up

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with a general opinion as a scientist on the overall strength or weakness of the association?

A. You can go through, and I've done this myself, review studies, summarize the results of the studies, talk about the strengths and weaknesses of the studies and describe the strength or, in some types, the weight of the association. I can do that.

Q. But you can't then put them together and say, I believe that studies A, B and C are the best; they show a strong relationship. And studies X, Y, and Z are not so reliable because they don't control for enough things and, therefore, I discount them. And come to your own independent conclusion based on a review of the data; can't you do that?

A. Within a set of criteria, I can.

Q. What criteria do you need?

A. Well, I just -- for example, I told that you in reviewing the epidemiology within a study, if we talk about studies -- just to take a number of 2 being the relative risk, anything below 2 being a weak association and above 2 a strong association, if that's your criteria, and we are talking about emphysema, I could say that

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several of the studies exceed 2 and so, based on that criteria, that would be a strong association.

Q. Okay. But you don't have an opinion as to whether, if some -- if a risk ratio is above 2, as to whether or not that's a strong relationship because it depends on the individual study?

A. I don't understand your question.

Q. Well --

A. Maybe you could restate the --

Q. Okay. Do you have an opinion, generally speaking, as to whether or not a risk ratio of greater than 2 implies a strong relationship?

A. In reviewing epidemiologic studies in the past, I have sometimes used 2 when I have been asked to do that as a criteria. I have also used 2-1/2. I don't think I've used 3, but I have used 2 or 2-1/2.

Q. All right. And in what sense have you used 2 or 2-1/2?

A. To describe whether the association was a stronger association or a weaker association, again using these relative terms.

Q. All right. And using these relative

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terms of strong or weak association and the cutoffs of 2 and 2.5 which you have used in the past, can you review a series of studies and then come to conclusions based on all those studies as to whether you believe there is a strong or a weak relationship?

A. Yeah, whether I believe based on those criteria. I mean, I am a scientist and I speak as a scientist and that's how I form my opinions. And I think that's what I've been asked to do in this is to give you my expert opinions.

Q. Yes. Let's go on then to talk about some other diseases. We've talked about kidney cancer, laryngeal cancer, lung cancer and emphysema.

Are there other cancers or diseases you're aware of where there is an associational relationship demonstrated between smoking and the disease?

A. There have been some statistical associations with liver cancer, with cardiovascular disease. Are we just talking about cancer?

Q. No.

A. Okay. That's what I thought.

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Cardiovascular diseases. Even with thyroid cancer. With uteral cancer and breast cancer. Leukemias.

Those are the ones off of the top of my head. There's probably some other associations that have been seen from time to time in epidemiologic studies.

Q. All right. Now, with respect to those that you mentioned -- and maybe I should do it one at a time, but -- well, maybe I better.

With respect to liver cancer, have you reviewed the epidemiological studies showing an associational relationship?

A. Yes.

Q. And do you believe that the associational relationship is strong or weak?

A. For the most part, those are below a relative risk of 2.0. So they would be down in what we talked about in the weak region.

Q. What about for cardiovascular disease, diseases, I guess?

A. Yes. Those studies tend to be very difficult because of the wide-spread cardiovascular disease in the general population and the various risk factors, risks from other

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factors.

Some of the studies show relative risks certainly above 2. Some do. A few do above 3. And there are several, after confounding factors are separated out, that are below 2.

Q. And have you, again, weighing through the -- withdrawn.

Have you subcategorized in your mind any of the cardiovascular diseases to talk about them specifically?

A. Well, the one that is referred to -- there's actually two that are referred to most commonly in the epidemiologic studies.

One is effects on the myocardium or the heart muscle. And the second is arteriosclerotic disease or the narrowing of the vasculature of the heart or other vessels in the body.

Q. Is that called arteriosclerosis?

A. Yes.

Q. Okay. And of those two aspects of cardiovascular disease, have you subspecified the relative risk ratios in the epidemiologic studies that have been done?

A. Yes.

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Q. And are they strong or weak vis-a-vis heart muscle impacts and smoking?

A. For impacts on heart muscle, the relative risks in several of the studies -- and this is -- I haven't looked at that for awhile, but there are several studies that are above 2 but below a relative risk of 3. There are also several that are below 2.

For arteriosclerotic disease, again, the relative risks are probably distributed around the same area. That's to the best of my memory.

Q. Okay. So would you opinion be based on your own criteria that there is a strong relationship between smoking and heart muscle and arteriosclerosis diseases?

A. Well, you are actually asking about two different types of diseases. As I indicated, there are, I think, several studies that deal with effects on the heart muscle that are certainly above relative risk of 2 and some above 3 which would be, according to the way we've, or the way I've classified it would be stronger associations.

For arteriosclerotic diseases, those, because of the difficulty in sorting that out, they tend to be everywhere from 1 up to 4 or 5.

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So those are more difficult to judge. Lifestyle has a major impact on arteriosclerotic disease.

Q. And have you made an assessment of those epidemiologic studies for arteriosclerosis specifically in order to come to a conclusion in your own mind as to whether the relationship is stronger or weaker based on the 2 to 2.5 criteria that we've talked about?

A. I tried to go through the arteriosclerotic epidemiologic studies several years ago for cardiovascular disease and have difficulty in trying to come to any type of conclusion on the studies because, as I indicated, there is such a large impact of other lifestyle factors.

So for arteriosclerotic disease, it's difficult to do. There's a wide range and there's not as much of a trend as for some of these others.

Q. Okay. What about thyroid cancer?

A. Thyroid cancer, most people now consider that as probably not related to cigarette smoking statistically.

Q. And what about uteral cancer?

A. Uteral cancer, some studies have

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shown an association below 2. Many of the studies have been negative. Most epidemiologists I know would probably rule that out as one that's associated with cigarette smoking.

The one that I was actually trying to think of before was colon cancer. And that's the other one that people often mention.

Q. Okay. Why don't we first touch on breast cancer and then leukemia and then colon cancer.

A. Breast cancer is still being debated. Again, there are many factors that have to be considered in breast cancer. Some studies do show a correlation, statistical correlation where the relative risk is above 2. Many of the studies, though, are below 2.

That's not as good a -- again, that's similar in my mind to arteriosclerotic disease in the difficulty in trying to sort out other factors. There appears, if there is, to be quite a weak relationship, below 2.

Q. Okay. And what about leukemias?

A. Leukemias is another one that's been debated quite a bit, and it really depends on the study. Many of the studies are not particularly

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good studies and have not done a good job in selecting out confounding factors. Most people believe, if there is an association, it's less than 2.

Q. Okay. And what about colon cancer?

A. Colon cancer is one that there are a lot of studies currently being done for colon cancer. The early studies for colon cancer showed a relationship of 1 or no relationship, statistical relationship.

In the last few years there have been some that have shown relationships between 1 and 2. I am not aware of any above 2 that I remember, and again the literature -- but those are relatively weak, if we define below 2 as weak.

Q. Well, and that's, again, just to -- when we say the "if," that's how you would define it, right?

A. That's one way of defining it.

Q. Okay. That's one way that -- I don't want to slide back to where we were, but I do have to ask you, Dr. Thomas, whether that's a gauge that you use as a professional in giving opinions and doing your work?

A. If I am in a public health forum and

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I am asked for an opinion, and often I will actually state it just as I've stated it to you that scientists such as myself, if it's below 2, will often say that's a weak relationship and that's how I'll state it.

Q. Let me ask this question. Why are you reluctant or sensitive to the concept of ascribing your own views about strength or weakness to the relative risk ratio?

MR. BYERSON: Objection as to form.

THE WITNESS: I don't think I am. I think I've tried to answer your questions the best I can. And I don't think I have shown reluctance.

I've shown reluctance to use terms that are not scientific terms in that these are vague and not particularly useful.

I like to be more specific and have given you the type of answer that you would expect from a scientist.

BY MR. CRANDALL:

Q. Okay. But wouldn't a scientist, though, in trying to translate his or her work for the public to understand want to try and convey in lay terms a message that would be comprehensible?

A. If I were a public health official

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and had to convey information to the public, I probably would use different terminology. And I've written public releases before where I have tried to strip out as much scientific jargon as I could.

But in this particular deposition, my understanding is that you are asking me scientific questions and I am giving you opinions the way I would as a scientist.

Q. Sure. And I understand that. I guess the question, though, is if we talk about relative risk ratios and you say, well, the relative risk ratio for kidney cancer is greater than 2 in some studies, that, to a lay person doesn't mean much, with all respect.

Whereas if you take that 2 or a risk factor and say, okay, a risk factor means -- is a relative term and I use it in the field of science and when it gets above 2, I think you have a strong or stronger relationship, and when it's below 2, I have a weaker relationship in my opinion, that's something that to me can be conveyed.

And at various times during the deposition you've kind of ascribed to that and

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then tend to back away from it at other times.

And so my question, with that preface is, don't you subscribe to the view that a relative risk ratio above 2 or 2.5 is a -- tends to show a strong relationship?

MR. RYERSON: Objection to the preface to the question.

MR. CRANDALL: It's okay. The question is --

MR. RYERSON: You may answer the question.

THE WITNESS: All I can do is give you my opinion as a scientist. I'm not being asked during this deposition to be a public health official and come out with recommendations for the public.

I have been asked to review scientific information about the scientific standards of cause and that's how I'm answering the questions.

And I'm not answering them with hesitation; I am simply trying to give you the answer that I think is accurate.

I guess maybe that's part of the problem. If I don't use terminology that we typically use in science, then I become inaccurate

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in the way I answer your question, and that's -- as a scientist, that's not what I should be doing.

MR. CRANDALL: Okay. Why don't we take a, just a five-minute break to get up and walk around.

VIDEO TECHNICIAN: Off the record at 13:30:45.

(A recess was taken.)

VIDEO TECHNICIAN: Going back on record at 13:39:20.

BY MR. CRANDALL:

Q. Dr. Thomas, just before we leave the subject, we've covered a fairly broad range of cancers and smoking dealing with lung cancer, kidney cancer, laryngeal cancer, emphysema, liver cancer, breast cancer, colon cancer, uterine cancer, thyroid cancer, leukemias, as well as cardiovascular diseases.

I realize that you may not have a perfect memory, but are there other diseases that you are aware of aside this list where, to your knowledge, there have been epidemiological studies and there have been associational relationships of any nature shown between smoking and the disease.

A. Yes, there have been others.

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Q. Can you -- having discussed it with me now for some time, give me an indication of what those others might be?

A. There's studies that have been done looking at various types of reproductive and developmental effects, such as birth defects, and smoking. There have been studies looking at other types of circulation problems other than arteriosclerotic disease.

And there have been attempts to try to draw associations with others, but I can't think of any that I remember that are consistently positive.

Q. Okay. In terms of birth defects and smoking, have there been epidemiologic studies showing an association between smoking and birth defects?

A. Well, there have been some studies that have shown some associations, but not reproducible studies.

Q. What do you mean by that?

A. Well, many of the studies have been negative; some have been positive. With reproductive effects, reproductive effects can be defined several ways.

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There's one that continues to be a statistical association, and that is low birth weight. And for a low birth weight, if you include that low birth weight specifically has shown increased relative risk or statistical associations with smoking, whereas most of the others have not on a consistent basis.

Q. So is it true with respect to low birth weight studies that the relative risk ratio tends to be above 2?

A. May of them are above 2 -- yes, many of them are above 2; some are below 2. But there are several studies above 2.

Q. And with respect to the circulatory problems and epidemiological studies on those diseases, have there been results that you're aware of in terms of relative risk?

A. Yes.

Q. What are those?

A. For a limited number of microvasculature problems, these are circulation within limbs, the problems are relatively rare. This is when there is a loss of circulation, say, to a foot or to a hand because of blocking of the -- what's called microvasculature in those or

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organs and tissues.

They're relatively rare. But in those cases where they have been found, there have been relative risks of 2 or even 3, 4 when smoking is brought into the comparison. Statistically.

Q. And again, if there are other diseases where there are epidemiological relationships that come to mind as we move off this subject, which I'm going to do now, I'd appreciate it if you'd let me know if something just -- a signal goes off in your head, okay?

A. Yes.

Q. All right. I want to turn to page 4 of your report involving molecular biology of disease. And I read what you said here in these two paragraphs, but I don't understand, and that may be my problem, and tough, but I don't understand the point of what you're saying.

Can you tell me in terms of these two paragraphs what part this -- these two paragraphs play in your opinion? In other words, what's the point of these paragraphs?

A. Since the early 1980s, there has been, I guess I could term it a revolution in the way toxicologists and other scientists studying

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health impacts of chemicals and other agents on humans and other systems have begun investigating those systems.

This was -- started with a set of tools in the early 1980s that are based on genetics and molecular biology.

And by the mid-1980s these tools began to be applied to the study of cells and how cells function and how the genetics within a cell or the genes within a cell, if you will, turn on and off to regulate the cell.

And as we have moved now into the 1990s, that molecular technology or molecular biology is now being applied to much better understand mechanisms of disease, as we have -- as I have described that earlier in this deposition.

And that's what these two paragraphs refer to is both the application of that new science and those new tools in being able to understand mechanisms.

Q. Okay. Vis-a-vis smoking and cancer, what advancements have molecular biology brought to the subject?

A. Some of the first -- well, molecular biology and these approaches, some of the first

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approaches in the 1980s was some of the tools like high performance liquid chromatography, which is mentioned in the second paragraph in this section gave us an ability then to isolate and identify chemicals in cigarette smoke when cigarette smoke condensates that we have not been able to isolate and identify before.

In the last few years, that technique has given us the ability to also isolate and identify not only reactive chemicals within biological systems, but to be able to modify those reactions to see what role they play in mechanisms.

On the genetic side, there have been extensive studies looking at the human genetic code, which are well-publicized, and the genetic code within laboratory animals and within testing systems, even to single cells that are used in the laboratory to understand how those models are functioning.

And those are helping us to begin to understand what's happening within biological systems. I guess that's it, a summary of what is happening in this area.

Q. Okay. Okay. What, if anything, is

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there in these revolutionary developments that affects your opinion in terms of being able to assess whether there is causality between tobacco and -- I mean cigarette smoking and cancers?

A. These tests to date, even though there have been a lot of studies done, especially in the last few years, have generally not given us very much new information in this specific area of cancer.

In other areas of cancer mechanisms unrelated to cigarette smoking, they've actually given us a lot of information. But in dealing with cigarette smoking, it has not helped us very much in understanding cause.

Q. Then let's look at the next paragraph which is on page -- the bottom of page 4 over onto the top of page 5. First, is this a paragraph that you have included in your other reports in the attorney general cases, if you know?

A. The best that I know, it is. It deals with risk factors, and that was an issue in some of the other attorney generals cases.

Q. Okay. What about the last paragraph? Is that something that was specific to the Iron Workers case or was that something that was in the

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other reports, as well?

And I am talking about the last -- not the conclusion, but the last paragraph, the second paragraph on page -- well, that was a bad -- the second paragraph under Other Risk Factors, which is on page 5.

A. I think that this paragraph was prepared specifically for this one. This deals quite a bit with risk factors posed in the workplace.

And I don't remember if in the other ones whether we dealt at all with that. But it's certainly an issue here, so my belief is that that paragraph was -- I wrote that paragraph specifically for this.

Q. Okay. And the last sentence says "Occupational risks" -- that I take it means cancer -- "should be considered as part of an overall evaluation of health risks in workers;" is that right?

MR. RYERSON: Objection as to form.

THE WITNESS: Occupational risks does not simply refer to cancer.

BY MR. CRANDALL:

Q. Okay.

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A. It refers to all health risks.

Q. Okay.

A. So if you would like to rephrase your question, I would be happy to try to answer it.

Q. In what way should occupational risks be considered as part of an overall evaluation of health risks in workers?

A. As I mentioned earlier in the deposition when we were talking more about cause, cancer is a multifactorial disease. There are several factors that contribute to cancer.

And basically what this sentence says is that in an occupational setting where -- or in a worker that, of course, could potentially be exposed to different risks in an occupational setting, that when you look at that person's cancer, you should also consider their occupational exposures and their occupational risks in addition to the other types of risk factors that they may have had.

Q. Have you done that in your assessment to issue your opinion in this case? In other words, how, if any way, have you factored in occupational risks in terms of the role that they play in cancers developing among foundry workers,

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coke-oven workers and welders?

A. Well, if you go back and look at these individual categories of workers -- well, the answer to your question is yes.

And if you go back and look at these individual workers, each one of these work classifications, if I can call them that, have specific risk factors that may increase the cancer for that occupation.

Lung cancer, specifically, for that occupation. There are other types of diseases, such as cardiovascular disease that we've discussed previously.

Q. Okay. And was this part of the fruit of the literature search that we talked about toward the beginning of your deposition?

A. That was part of that. I've been aware of -- I've been involved in occupational studies of worker risks dating back to at least the late 1970s.

And so I've visited steel mills and have seen coke ovens and so forth, so I am familiar with these. But it does result somewhat from the more recent review that we had done. But that's not all of it.

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Q. Okay. Well, let's focus then in on where you have, for example, foundry workers, coke-oven workers and welders. What are the studies that you have reviewed that lead you to your conclusions about foundry workers?

A. Well, I cited some in this set of references. And I mean, we have gone back through these before, but.

Q. I guess logically I would look at the end if they were stuck there. But that's not where -- is that where they appear?

A. Well, some of them do. There are -- I mean, a lot of these deal with -- these are epidemiologic studies and they deal with different populations as well.

For example, halfway through there is a set of studies on railway workers and diesel exhaust and foundry workers are exposed to diesel exhaust as well.

But towards the end there are some that deal with welders. And Billings on page 14, 1993, and Stern, 1997, those are iron workers. And then foundry workers is Andjelkovick, 1990. Gunther -- it looks like we have several at the end. Sorahan.

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Q. All right. And when you say that these risks should be considered, how should they be considered? In other words, in what way will you tell the jury that they should be considered?

MR. RYERSON: Objection as to form.

BY MR. CRANDALL:

Q. Well, you do intend to testify at trial, if called, correct?

A. Yes.

Q. All right. And what is it you expect to say at trial other than the fact at that the occupational risks should be considered? Do you intend to go into any detail about those risks?

A. I, of course, haven't decided that as yet. We haven't talked about testimony. I think in here I've made a correct statement is that they should be considered in trying to understand cancer risks in a population.

Q. Okay.

A. But the individual ones could be separated out and we could look at the relative risks of those compared with other relative risks.

Q. Okay. But how should they be considered? In other words, can you be -- other than saying, look, before you figure out any

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relationship between iron workers' exposure to tobacco smoke and cancers, you also want to look at occupational risks, right?

A. Yes.

Q. Okay. And how does one do that?

A. Obviously, there are various approaches to that. And we are dealing with statistical values here.

One of the simplest ways is to take the approach that we've taken earlier in this deposition, and that's to go through and, that's -- since we have got an example here, let's take foundry workers.

If we went through foundry workers and say, okay, a foundry worker is exposed to dust and do we see an increase in cancer risks related to the foundry worker's exposure to dust and do we see an increase in emphysema?

And then we could list on a blackboard what those relative risks are compared with a smoking and a non-smoking population. You have foundry workers that smoke and foundry workers that don't.

And by doing that, then a jury would begin to understand that, at least in that one

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statistical comparison, that their risks, at least based on the relative risk ratios, may be higher or lower depending on how they rank.

If you started with a list and the larger numbers are on top and the smaller numbers are on bottom, that would give you a relative ranking of the relative risks. That's one way to do it.

Q. Have you looked at these studies regarding foundry workers in terms of relative risks?

A. Yes.

Q. Okay. And what did you conclude? What did you find?

A. Well, there are relative -- there are increased relative risks in foundry workers based on their exposures within the foundries to particulates, depending on the type of foundry they work in as well, to some metals, in addition to just the particulates of dust.

And so in those diseases where there is a statistical relationship with some of those exposures, you do see increases.

Q. Okay. And the term you have here is identified in the literature as being at elevated

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health risks, correct?

A. Yeah, as a population, foundry workers have a higher -- and again, as we've talked about it, it depends on the study.

But if you take a representative study of foundry workers and subtract out the smoking, you still find that there is an increased relative risk for certain diseases.

Q. Okay. And can you tell me what the relative risks are for what diseases?

A. Well, not without going back to the individual studies. But I mean, the two that we've been talking about, lung cancer and emphysema, are two that you see increased relative risks in some studies for foundry workers, and there are others, as well.

Q. And increased what relative risks at what levels?

A. Well, it depends on the study, again, but we're talking about relative risks above 2. And in some cases above 3.

VIDEO TECHNICIAN: Going off the record at 14:02:25.

(A discussion was held off the record.)

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VIDEO TECHNICIAN: Going on the record at 14:03:10.

BY MR. CRANDALL:

Q. Okay. We were talking about the foundry workers studies and the relative risk ratios vis-a-vis lung cancer and emphysema after controlling for smoking.

A. Yes.

Q. Are there studies that you have -- which studies are you talking about with the lung cancer and emphysema?

A. I would have to go back and look at the specific ones. The mortality of iron workers overall findings in the Journal of Occupational Medicine, 1990 study, deals specifically with that issue.

And Sorahan in his study in '94 also dealt with both issues. Some of the others may have also, but I haven't looked at them, since I've prepared this, in that much detail.

Q. Okay.

A. There are other studies that I haven't listed here, too, that we could take a look at, but I think those are good representative studies of the literature.

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Q. Okay. I only want to take a look at them if, in fact, you intend to rely on them at part of your expert opinion at trial. If you do, I most certainly want you to tell me what they are.

Because we are operating under the assumption that any of the references that you need to -- expect to refer to that a court jury on will be identified before for us, and so it is important that you let me know if there are others that are not here upon which you may rely at trial.

A. Okay.

Q. Are there any others?

A. I don't know. I think those are good representative articles. They have this information in them. I don't know what the standards are, the legal standards.

And since I haven't gotten to the point of preparing to testify, I don't know exactly which ones, but I'd certainly want to rely on some of the information in the ones that I have cited. I think those are good studies.

Q. Okay. And I have no problem with you relying on the studies that you've cited. But if

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there are others -- if there are other studies, I most certainly do want to know about them today.

Because this is my opportunity to take your deposition and ask you questions about them. And I don't want to be faced with, two months later, hearing about some foundry workers study that was not listed on your expert witness report.

So it is important for me to know today if there are any other such studies upon which you expect to rely at trial?

A. Okay.

Q. Are there?

A. I don't know. I haven't even thought about it. And I don't know what the rules are in this case, the legal rules.

MR. RYERSON: If I may interject here, you are free to ask your questions, but this really seems to be a legal standard you're getting at that the witness is not familiar with.

MR. CRANDALL: I agree, but it's factual predicate for some things that may happen.

MR. RYERSON: Well, you're certainly entitled to ask him if he's aware of any other studies on which he expects to be asked at trial.

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And I think he really effectively answered that.

MR. CRANDALL: I think he answered it I don't know. Let me ask it again.

BY MR. CRANDALL:

Q. Are you aware, Dr. Thomas, of any other studies related to the issue of occupational diseases specific to iron workers that -- upon which you will rely at the trial to support your opinions?

A. I am not aware of any right now.

Q. Okay. Now, you also have coke-oven workers as another category on page 5 of your report.

A. Yes.

Q. What are the studies upon which you will base your conclusions about coke-oven workers and what are the relative risks that you found?

A. Well, I had mentioned these studies at the end and also there are studies earlier that refer to coke-oven workers, particularly those that deal with Benzapyrene.

I had given you some of the Benzapyrene studies when we went through this list. If you'd like, I can go back and dig those out again, but they have that in their title.

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Q. Benzapyrene, Lazar, on page 4 toward the bottom?

A. Yes. The concern about Benzapyrene is that's one of the constituents of coke-oven emissions that workers are exposed to.

And so if you even look at the Robbins' Pathology textbook and look at occupational settings, you will see a description and discussion of coke-oven emissions of concern for potential health effects. And that's cited here, as well.

Q. Okay. And is that carcinogenicity, is that something that has been shown through the experiments in animals to cause cancer?

A. For Benzapyrene?

Q. Yes.

A. Yes.

Q. So that would fit within your definition of causation, then, as a cancer-causer.

A. Yes, it would.

Q. Okay. What else, other than Benzapyrene, is a concern with respect to coke-ovens workers?

A. Well, coke-oven workers are exposed to a lot of vapors from the coking process. Some

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of those vapors have not been characterized, but they have tar particulates and so forth in those, of which some contain Benzapyrene and some do not.

So there's not only exposure to tar-type materials as a particulate, but exposures to particulates themselves containing tar and various breakdowns of coal and materials associated with coal.

In addition, workers are exposed to very high temperatures often and infrared radiation, and there's -- I think those are probably some of the major exposures other than also their increased risks of various types of accidents in handling large equipment, including even such things as burns.

Q. Okay. Is there anything else with respect to coke-oven workers in terms of the potential cancer-causing exposures that you've already talked?

A. I think those are the main ones.

Q. All right. What about welders?

A. Welders are exposed to a number of fumes depending on the type of welding they're doing, whether it's electrical welding or acetylene welding or some very specialized welding

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that is used for such things as titanium and stainless steel.

But they are exposed to a host of fumes, some of them are chemical fumes, some metal fumes, and they're also exposed to particulates at high concentrations from time to time, depending on the type of equipment that's being used, especially if it's a robotic or batch welding process they are involved in.

And also heat and some other types of exposures.

Q. And are there any of the studies at the end of Exhibit -- of the list of references or elsewhere, but let's look first at the end, that support your opinion in this regard?

A. Several of the ones that I mentioned, the iron workers include welders, Billings, '93 on page 14 specifically mentions welders and welders' lung.

You often find welders in iron foundries and in foundry works or iron plants of various types, so they're a job classification that you find in these other studies well that we've noted. And some of the other textbooks here such as Robbins' Pathology, also mentions welders.

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And I'd have to look at some of the other references. There may be some of the other references in there that deal with welders and COPD.

Q. Okay. Have we talked about now the information that you have reviewed with respect to foundry workers, coke-oven workers and welders in terms of the elevated health risks from exposure to workplace substances?

And by that, I'm asking, is there anything else that you can think of, either in terms of category of iron workers or reference material that you haven't mentioned, that you believe bears upon your opinions in this case?

A. Well, these were examples that I pulled out. There are other occupational categories that are in iron workers that I haven't mentioned.

Q. Okay. Which are those?

A. Electricians, boiler makers or boiler fabricators. Depending on the type of equipment, brick masons, locomotive operators and equipment operators such as crane operators.

There are chemists involved in these settings as well. And then you have office staff,

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managers, secretaries.

Q. So everyone affiliated with the industry is subjected to elevated health risks?

MR. RYERSON: Objection as to form.

BY MR. CRANDALL:

Q. Well, how are office staff part of the elevated health risk?

A. Well, there may be studies that in some industries, office staff, because of their immediacy to the foundry, if it's a foundry we're talking about, may in fact would be exposed to elevated concentrations of the contaminants that the workers would be exposed to. We would expect that their exposures would be less, but they're still exposed.

In some of the occupational studies that I've looked at in the past, I have seen elevated risks in workers, in office workers, and so forth that forth that it's thought to be related to their exposures to the materials from the foundry site.

Q. Okay. Are there any other categories of workers that you're familiar with about which you intend to give opinions at trial with respect to elevated health risks aside from what you've

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already testified to?

A. I can't think of any.

Q. All right. Now, how, in your opinion, have the risks been elevated for these workers, these iron workers?

A. From -- the elevated risks are usually related to exposures.

Q. All right. And are you able to quantify what that elevated risk is vis-a-vis iron workers in general?

A. I don't remember in any of the studies that there has been an attempt to try to talk about iron workers in general because, as I've indicated, that involves several different job classifications.

The studies, the epidemiologic studies themselves are not -- are difficult to conduct and often are hard to interpret because of confounding factors. And so what you try to do is narrow those to one job classification rather than lumping a whole group together.

So I don't remember if in any of these epidemiologic studies they picked out a whole industry and said, you know, this is an elevated risk, quote, for this industry. More

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than likely, it was for individual job classifications.

Q. But are you able, as we sit here today, to quantify what the elevation is in the risk levels for the iron workers?

A. No.

Q. And --

A. That doesn't mean it hasn't been done. I just -- I can't do it today.

Q. And are you able to -- withdrawn. What additional work, if any, do you expect to undertake between now and the time of trial in terms of developing and formulating your opinions?

A. Well, I would go back and read the materials that I've got, review the references that have been attached to this. And I assume Mr. Ryerson and I will have some discussions about technical issues that may be coming up in the trial that they feel are important, and then we will discuss whether I can address those based on what I've presented thus far.

Q. All right. But in terms of -- we've now gone for the better part of a day at least discussing your opinions, we're getting to your

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conclusions now.

But from what we've discussed, is there any other work that you plan to do other than what you just said in terms of preparing for trial?

A. No.

Q. Now, on -- going on to your conclusions, there is a -- on page 5 in the second paragraph that starts with the word "In reviewing the scientific literature."

A. Yes.

Q. You make a statement there that follows that fragment. "It is clear that there was an ongoing scientific debate, and there was not agreement that smoking was causally related to lung cancer." Do you see that?

A. Yes.

Q. Why did you phrase it in terms of the 1964 Surgeon General's report? Why did you phrase that statement that way?

A. I think that the 1964 Surgeon General's report represented a landmark report, when before that time there was clearly an ongoing scientific debate among scientists.

And that report pulled a lot of this

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opinion together and I think really developed the agreement that there was the statistical correlation between smoking and lung cancer that we've talked about earlier.

So it's -- the reason I separated it that way is because that really is a landmark report and it's an important period.

Q. But in that report you use the term -- not in the report, but in the sentence there you say "There was not agreement that smoking was causally related to lung cancer." That's your wording, correct?

A. Yes.

Q. Well, in point of fact, you still don't believe that smoking is causally related to lung cancer even in 1998, do you?

A. Not the way we have defined cause.

Q. All right.

A. The Surgeon General's report defined it several different ways. Principally, they talked about the strength of scientific evidence, particularly the epidemiologic studies, and indicated that if they had a lot of epidemiologic evidence that they would refer to that as cause from a public health standpoint, and that's how

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that's actually used in that sentence.

Q. Okay. So in this sentence you are using causally differently than you did elsewhere in your report?

A. I believe so in that this is referring specifically to the attorney general's report.

Q. You mean the Surgeon General?

A. I mean the Surgeon General's report.

Q. Okay. All right. Because if you were using the language the way you would phrase it, you would say there was not agreement that smoking was associationally related or something like that? You wouldn't use the word "causal."

A. Well, like I say, the report used it in one way which, if they want to use it that way and define it that way, that's acceptable from -- for use.

And I think I've described the way I use it. And in fact the Surgeon General's report also described that approach or that definition for cause basically giving those two clear definitions.

But this language in this sentence is referring to -- specifically to the Surgeon

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General's report.

Q. All right. Now, on paragraph 6 -- page 6, I'm sorry, at the top of the paragraph there's a -- at the top of the page there is a paragraph that I don't quite understand. Can you tell me why you included this in your report? This last paragraph here.

A. You are talking about this paragraph at the top of the page?

Q. Yes.

A. That starts "additionally"?

Q. Yes.

A. I reviewed these documents that were introduced as exhibits in the Karbiwnyk case and those were company documents. To date, most of what I've reviewed has been scientific published literature.

So I included this as an explanation and the fact that there actually are some company documents that I'd reviewed for this case, and those were the ones that were entered in Karbiwnyk. So it's -- I think I put it in because it's a bit different than most of the work that I've done.

Q. Okay. And what was the research that

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you reviewed by the biological research division and about which you testified in Karbiwnyk?

A. On Karbiwnyk, there were a set of documents that were introduced by plaintiffs concerning the research of the biological research division.

And I was asked to examine those documents and to indicate whether I thought that information was publishable research, for example, whether it would have contributed to the state of scientific knowledge, and whether that information provided additional scientific evidence of causality.

When I reviewed that information I basically answered no to all those questions, as you see in this paragraph.

Q. Okay. And who gave you that information to look at? Was it the R.J. Reynolds lawyers?

A. That information, like I say, were the plaintiffs' exhibits that were entered in Karbiwnyk, and I went through those exhibits. They were given to me by the attorneys for Jones, Day. I assumed it was a complete set of what was entered in Karbiwnyk.

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Q. Okay. And did they -- what was the purpose for them giving you these documents and asking for your opinion on that subject?

A. Well, I have run laboratory animal studies myself in some detail and I know how laboratory animal studies are conducted. I've also started laboratories and set up laboratories.

So they felt at the time that I would be a good expert to review those and give a statement as to whether those were major scientific reports or whether those were other types of reports.

And because I had had experience in that area, that's what I -- the reason I reviewed them.

Q. Okay. And you testified, it says here, "that the research described was not designed to prove disease causation;" is that right?

A. Yes.

Q. How did you reach that conclusion? How do you know that?

A. These were the types of studies that were done to basically set up a laboratory, to standardize procedures used in a laboratory, make

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sure that they're repeatable.

And the types of work that I had reviewed in these documents for Karbiwnyk were -- was identical with some of the types of work that had been published or that I was aware of that had been conducted, although most of this work, if not all of this work, is not really publishable; it was preliminary.

But there was nothing new in that. In fact, it was -- it was fairly preliminary work compared with what was published.

Q. What did it involve? I mean, what did the work involve? Was it involving cancer?

A. It was involving laboratory animal studies in rats and rabbits and, to a limited extent, mice.

Q. Okay. And can you be more specific? Were they exposed to a substance?

A. They were exposed to -- as I'd indicated, this was to develop techniques. This was a new laboratory.

And so one of the new techniques was a smoking machine, and they were carrying out smoking studies mainly on rabbits and, to a limited extent on mice -- I mean on rats, to try

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to see if they could perfect the smoking machine and perfect the techniques of delivering the cigarette smoke to the animals.

Like I say, these were methods development types of experiments rather than trying to conduct a statistical study with a lot of animals to see whether or not you were able to produce cancer.

Q. All right. And -- okay. And the point for putting this in your report in this case is to show what?

A. Well, it's to show that I had reviewed a set of internal company documents that I had not really done before throughout the 14, 15 years that I've been involved in reviewing materials for Jones, Day.

It's all been published peer-reviewed scientific literature. I haven't delved into company documents until this set. So this was a departure from what I had typically done.

Q. All right. You have not, though, have you -- withdrawn.

Are you using this in some way to illustrate the fact that whatever research was done by the tobacco industry -- withdrawn.

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When was this BRD research conducted by R.J. Reynolds, approximately?

A. It was approximately the 1960s, mid-1960s. That's the best date I can remember.

Q. All right. And --

A. It was actually the late 1960s, early 1970s. But that's -- I am rough on the dates.

Q. Okay. And are you attempting to show here that -- withdrawn.

And was this research from the BRD division not made available; is that the idea?

MR. RYERSON: Objection as to form.

BY MR. CRANDALL:

Q. Well, as far as you were aware in connection with your review of the documents and your testimony in the Karbiwnyk case, had the BRD documents been disclosed to the public in any form?

A. Well, my understanding, and this is just simply my understanding, I was given these documents and was asked to review them. These were internal company documents which would indicate that they had not been released to the public previous to that time.

I don't know as to what their

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background was other than that there were research reports of that division and summaries of what had been done.

Q. All right. Do you intend to testify in this case that the tobacco -- whatever research vis-a-vis laboratory animals and such experiments that has been conducted by the tobacco industry is -- withdrawn.

Do you intend to testify, based on this paragraph here, that whatever internal company documents might be in the possession of the tobacco industry would have not contributed to the state of scientific knowledge if it had been made public?

A. No.

Q. And you haven't asked, have you, to see the universe of all internal company research that may exist on any associational studies between smoking and cancer, have you?

A. No.

Q. Right at the bottom of the second to the last paragraph, it looks like there's a typo or something, and I just don't understand what it says. It's the third sentence up. It says, "Experiments were conducted by the produced." Do

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you know what was wrong there?

A. This is a typo and I caught this after this was sent in.

Q. What it's supposed to say?

A. It should say experiments that were conducted by the BRD.

Q. Okay. So it should say -- we're missing the word "BRD" there?

A. Conducted by the BRD. Did not -- should be did not produce or -- "produced" is really strange. But did not produce the results necessary to confirm that cigarette smoking is causally related to human lung cancer.

The gist of the sentence, and I'm not quite sure how this got out without catching this mistake, but it should have indicated that the ones that I had reviewed for Karbiwnyk, I did not see from those results that they would confirm that cigarette smoking is causally related to human lung cancer. That's what the sentence should have said.

Q. Okay. And when you use causally in this last sentence, are you referring to it in the -- in your sense of causal relationship or in the broader sense of causal relationship?

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A. In the scientific sense.

Q. Meaning the demonstration of an effect in the laboratory animal?

A. Yes, a mechanism.

Q. Mechanism.

A. Yes.

Q. Okay. Let's go off the record for right now.

VIDEO TECHNICIAN: Going off record at 14:37:12.

(A recess was taken.)

VIDEO TECHNICIAN: Going back on record at 14:42:25.

BY MR. CRANDALL:

Q. Dr. Thomas, just a few more questions for you. First, on page 3 of your report, under the heading Public Health, there is a statement that assesses laboratory studies in which animals have been exposed to whole cigarette smoke or fractions of it using inhalation as the route of exposure. Do you see that?

A. Yes.

Q. And your opinion is that these results have not produced -- I'm sorry, that these experiments have not produced the results

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necessary to confirm that cigarette smoking is causally related to human lung or laryngeal cancer; is that right?

A. Right, that's what it says.

Q. Okay. And that is your opinion; correct?

A. Yes.

Q. All right. Now, are there any scientists you're aware of who do believe that the necessary showing based on laboratory animal experiments has been made from a causal point of view, as you use the term causal?

A. As I use the term causal, no. The scientists that I'm aware of that have reviewed the information in detail from laboratory animal studies have come up with the same conclusions that I have.

I can't speak for other scientists, and there may be one or two, but I don't think I've heard of ones that have come up with a different conclusion.

MR. CRANDALL: Okay. With the exception of some issues related to the documents to be produced and some legal issues that may be raised with respect to this deposition, I have no further

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questions.

MR. RYERSON: I'm not sure I understand what legal issues may be raised. Is there anything we can address today?

MR. CRANDALL: Well, it's not something that I think needs to be discussed right now on the record, but there are -- there were certain responses to questions that I think may either result in motions or things of that nature.

But it's not -- I mean, I don't know whether it's productive to debate them right now.

MR. RYERSON: No, I don't think it would be productive to debate them. I'm just encouraging you, if there's anything the witness can do for you today in terms of responding to your questions, you have up to seven hours if you want them.

MR. CRANDALL: Oh, I understand.

MR. RYERSON: And I'm encouraging you to ask any witness anything you are capable of asking the witness.

MR. CRANDALL: No, no. And I have, I have received responses in some areas that concern me with respect to trial. But I have asked those questions, so.

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MR. RYERSON: All right. Then the deposition is concluded. Dr. Thomas reserves the right to review and sign his transcript.

MR. CRANDALL: Okay.

VIDEO TECHNICIAN: I, Brian Nern, the video camera operator, do hereby verify that the witness whose testimony appears in the foregoing videotaped deposition was duly sworn on camera and was taken by me on videotape.

This is a true and accurate record of the testimony. Any objections were made at that time. No alterations, additions or deletions have been made.

I am not related to nor employed by any parties to this action. I have no direct interest in the outcome of this or any action to which this videotaped deposition was recorded.

The time is 14:46:02, and this deposition is now concluded.

(TIME NOTED: 2:46 P.M.)

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I declare under penalty of perjury under the laws of the State of Ohio that the foregoing is true and correct.

Executed on _____, 19____, at_____,_____.

_____

SIGNATURE OF THE WITNESS

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DISTRICT OF COLUMBIA) ss:

I, JAYNE M. TOERING, do hereby certify:

That the foregoing deposition of DR. RICHARD THOMAS was taken before me at the time and place therein set forth, at which time the witness was put under oath by me;

That the testimony of the witness and all objections made at the time of the examination were recorded stenographically by me, were thereafter transcribed under my direction and supervision and that the foregoing is a true record of same.

I further certify that I am neither counsel for nor related to any party to said action, nor in any way interested in the outcome thereof.

IN WITNESS WHEREOF, I have subscribed my name this 6th day of January, 1999.

Jayne M. Toering

JAYNE M. TOERING

My commission expires:

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THURSDAY, DECEMBER 17, 1998

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EXPERT WITNESS REPORT

Richard D. Thomas, Ph.D.
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DEPOSITION EXHIBIT

INTRODUCTION

I am Director of the International Center for the Environment and Health of the Medical Service Corporation International. I was previously Director of Human Toxicology and Risk Assessment (formerly Toxicology, Epidemiology and Risk Assessment) at the National Academy of Sciences/National Research Council. My training and professional experience is in toxicology, pathology and epidemiology. I specialize in understanding the mechanisms of disease in humans and in designing studies to better define biologic disease processes. I have conducted comprehensive studies on pulmonary diseases, including cancer, and diseases of the larynx, including cancer. I have examined in detail the standards of causation of chronic diseases and the mechanisms of cancer.

I was asked to review medical and scientific literature relevant to the state of the medical knowledge from the 1930's to the present with respect to standards of causation and mechanisms of carcinogenesis, emphysema and other respiratory diseases, particularly with respect to the identification of cigarette smoke as an alleged cause of human lung cancer, laryngeal cancer and chronic obstructive pulmonary disease (COPD). COPD can be defined as a group of conditions that share a common symptom, dyspnea (difficult or labored breathing), and are associated with chronic or recurrent obstruction of air flow in the lungs (Pathologic Basis of Disease, 1994).

MECHANISMS OF DISEASE

Scientists have long recognized that cancer is a complex biologic process. An enormous amount has been discovered over the past twenty years concerning the molecular biology, cell biology, and biochemistry of cancer. However, much work remains before we

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understand the underlying mechanisms of tumor development for most forms of cancer. There are often several factors that are unique to an individual that must be present before cancer can develop. These factors include: the unique metabolism of chemicals (uptake, distribution, activation, detoxification and elimination), DNA repair, inherited or acquired genetic factors, environmental factors, nutritional status, hormonal factors, and immunologic factors. Researchers have recognized for many years (Surgeon General, 1964) that cancer is a complex biologic process; nonetheless, some forms of cancer such as retinoblastoma in children and colon-rectal cancer, HNPCC (hereditary nonpolyposis colorectal cancer) in adults over 50 years of age, are well understood and the underlying biologic mechanisms have been determined (The Molecular Basis of Cancer, 1995). The mechanisms of human lung and laryngeal cancer causation are not understood and are currently the basis of extensive scientific investigation. Further, the mechanisms of human emphysema causation are not known.

In the absence of an understanding of the mechanism of a disease, epidemiology alone is not capable of establishing that an agent is a "cause" of a particular disease. Therefore, when only epidemiology is available to show an association between an agent and a disease, an appropriate animal model is necessary, to confirm that the agent is in fact what is causing the effect. Laboratory proof is needed before a substance can be identified as a cause of cancer or other diseases, such as emphysema. In 1989, I published a research paper (Regulatory Toxicology and Pharmacology) describing the importance of the use of laboratory animal models in investigating emphysema and cigarette smoking in humans.

ANIMAL STUDIES

Animal models have made significant contributions to our understanding of the development and progress of disease in humans. To identify a causative agent, laboratory animal studies should be properly conducted and meet certain requirements that include: the use of an appropriate animal model, administration through the same route of exposure as humans, with the same organ systems exposed, and at an appropriate dose of the test substance. For example, in examining cancer, these experiments must produce a statistically significant excess of the number of human type cancers in the exposed animals, and be replicated in other studies before the substance can be identified as a cause of cancer.

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PUBLIC HEALTH

When there is an epidemiologic association between an agent and disease, it is not necessary for officials to understand the "cause" of a disease in order to take action to protect public health. Prospective and retrospective epidemiologic studies clearly show an association between cigarette smoking and cancer (U.S. Surgeon General, 1964). However, based on my review of the laboratory studies in which animals have been exposed to whole cigarette smoke, or fractions of it, using inhalation as the route of exposure, laboratory animals experiments have not produced the results necessary to confirm that cigarette smoking is causally related to human lung or laryngeal cancer. In 1982, the U.S. Surgeon General's report stated, "Attempts to induce significant numbers of bronchogenic carcinoma in laboratory animals were negative in spite of major efforts with several species and studies..." There have been few laboratory inhalation studies conducted since 1982, and these later studies have generally provided negative results.

In the 1964 Surgeon General's report, the authors stated, "...the mere establishment of a statistical association between the use of tobacco and a disease is not enough. The causal significance of the use of tobacco in relation to the disease is the crucial question. For such judgements all three lines of evidence (i.e., animals experiments, clinical and autopsy studies, and population studies) are essential." Although the results of certain clinical and autopsy studies and studies on cancer biology serve as part of the basis for biologic theory, they do not meet the criteria described above for "standards of causation." This is especially so for lung cancer, emphysema and laryngeal cancer, which appear in a minority of persons who smoke.

The U.S. Surgeon General (1984) and the National Research Council/National Academy of Sciences (1988) have reported that emphysema has not been demonstrated in whole animals or animal populations exposed to cigarette smoke. For this reason, it has been difficult to develop an animal model to study causes of emphysema in humans (Regulatory Toxicology and Pharmacology, 1980). In addition, several theories of emphysema development have been proposed. These include the proteolysis-antiproteolysis mechanism, the oxidant formation mechanism, and the pulmonary macrophage-releasing protease mechanism. Without an adequate animal model, these proposed mechanisms remain theories. Most recent studies (J. App. Physiology, 1995) suggest that the most popular theory for the cause of emphysema in humans, the proteolysis-antiproteolysis theory, is not correct.

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Experimental studies are still being conducted in this field, since the biologic mechanisms for emphysema are not known. What is known is that there are several factors that may contribute to the development of emphysema including: age, sex, genetic factors, cigarette smoking, familial factors, occupation, and the environment (Toxicology, 1986).

MOLECULAR BIOLOGY OF DISEASE

Over the past thirty years, rapid developments have occurred in molecular biology and in understanding the underlying mechanisms of disease. Toxicology is the science of studying the adverse effects of chemicals and other agents on biologic systems. The recent dramatic developments in molecular biology have lead toxicologists to a better understanding of the mechanisms of disease. Toxicologists now use not only the descriptive animal toxicity tests, but the tools of molecular biology to test chemicals and discover possible hazards to humans (Toxicology, 1986). Further, significant development has occurred in analytic procedures to detect and quantify biologic markers of disease.

Biologic markers are indicators or signals in a biologic system that a chemical or other agent has had some impact on the system. Markers are measurable biochemical, physiologic, or structural alterations within a system. Depending on the magnitude and location of the biologic change, the marker may indicate normal physiologic response, potential health impairment, or advancing disease processes. It was not until the early 1980's that the analytic technology became available to isolate and identify biologic markers in tissues that can be used to understand the mechanisms of disease in lungs and other organs. For example, the development of HPLC (high performance liquid chromatography) revolutionized the field of mechanistic biochemistry and toxicology, and allowed researchers to quantify markers in tissues at very low concentrations. Using techniques such as HPLC, researchers are now able to assess the role of biologic markers in disease and better understand the disease process.

OTHER RISK FACTORS

In addition to studying and researching the alleged relationship between cigarette smoking and human lung cancer, respiratory disease and laryngeal cancer, I have also examined the suspected role of other environmental and occupational exposures in the

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development of these diseases. For example, exposure to radon, uranium, diesel fuel exhaust, metal dust, alcohol and other factors are known to increase the risk of developing cancer.

The scientific literature contains important toxicologic information that the workplace poses significant health risks to workers. There are several disease categories of occupational health risk described in the literature such as cancer, respiratory disease, and cardiovascular disease that are specific to various occupations. For example, foundry workers, coke-oven workers and welders are some of the occupational categories identified in the literature as being at elevated health risks from exposure to substances in the workplace, even after adjusting for lifestyle. Cardiovascular risks due to workplace exposure do not appear to be as widespread or as significant as other health effects such as cancer, but they do exist and are often reported in the literature. Occupational risks should be considered as part of an overall evaluation of health risks in workers.

CONCLUSIONS

I have reviewed (1) toxicologic experiments in which animals have been exposed to whole cigarette smoke, or fractions of it, using inhalation as the route of administration; (2) a large number of experiments in which various animal species have been exposed to cigarette smoke "condensate" or "distillate" by means of skin painting; (3) the dosimetry of those studies, in an effort to determine the doses of smoke or condensate that reach and act on particular organs; (4) studies on the biologic markers of exposure, effect, and susceptibility; and (5) the use of biologic markers in epidemiologic studies on cigarette smoking. I have also examined the criteria for the classification of particular substances as probable or possible carcinogens under a variety of regulatory schemes.

In reviewing the scientific literature prior to the 1964 Surgeon General's report, it is clear that there was an ongoing scientific debate and there was not agreement that smoking was causally related to lung cancer. In the 1964 Surgeon General's report, the committee was unable to determine that smoking is causally related to emphysema. Although epidemiology has established an association between cigarette smoking and lung cancer, laryngeal cancer, emphysema and certain other diseases, laboratory animal experiments have not produced the results necessary to confirm that cigarette smoking is causally related to such diseases in humans.

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Additionally, in connection with my trial testimony on October 23, 1997 in Karbiwnyk v. R. J. Reynolds Tobacco Company (4th Judicial Circuit, Duval County, Florida), I was shown certain documents, which plaintiff had placed in evidence in that case, concerning research that was conducted by R. J. Reynolds Tobacco Company's Biological Research Division ("BRD"). Based upon the plaintiff's trial exhibits in Karbiwnyk, I testified that the research described in those documents was not designed to prove disease causation; was not publishable; and would not have contributed to the state of scientific knowledge if it had been made public. Neither laboratory animal experiments that were reported in the published literature nor, insofar as I am aware, experiments that were conducted by the produced the results necessary to confirm that cigarette smoking is causally related to human lung cancer or emphysema.

A listing of references upon which I principally rely (but do not necessarily agree with all statements or conclusions in) in connection with this report is attached hereto.

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Richard D. Thomas, Ph.D.

Dated: 11/16/99

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